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MASSACHUSET
AGRICULTURAL COLLEGE
1863

# Annual Report

OF THE

# AMERICAN INSTITUTE

OF

THE

# City of New York

FOR THE YEARS

1867 & 8.

Albany
Charles Van Benthuysen & Sons
1868

THE MASSACHUSETTS AGRICULTURAL COLLEGE 1863

# ANNUAL REPORT

OF THE

# AMERICAN INSTITUTE,

OF THE

# CITY OF NEW YORK.

FOR THE

## YEAR 1867-68.

ALBANY:
PRINTING HOUSE OF CHAS. VAN BENTHUYSEN & SONS',
1868.

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# State of New York.

## No. 162.

# IN ASSEMBLY,

April 7, 1868.

## TRANSACTIONS OF THE AMERICAN INSTITUTE.

American Institute,
New York, *April 3d*, 1868.

To the Hon. William Hitchman,
*Speaker of the Assembly of the State of New York:*

Sir — I transmit herewith the Anuual Report of the American Institute of the City of New York, for the year ending in April, 1868.

I have the honor to remain,
Very respectfully,
Your obedient servant,
SAMUEL D. TILLMAN,
*Corresponding Secretary.*

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# AMERICAN INSTITUTE.

## OFFICERS FOR 1868.

### TRUSTEES.

President.
HORACE GREELEY.

Vice-Presidents.
DUDLEY S. GREGORY,
ORLANDO B. POTTER,
CHARLES P. DALY.

Recording Secretary.
FRANK MOORE.

Corresponding Secretary.
SAMUEL D. TILLMAN.

Treasurer.
SYLVESTER R. COMSTOCK.

### MANAGERS OF THE FAIR.

WILLIAM H. BUTLER,
THOMAS McELRATH,
GEORGE PEYTON,
J. GROSHEN HERRIOT
CHAS. WAGER HULL,
ORESTES CLEVELAND,
NATHAN C. ELY,
WILLIAM S. CARPENTER,
JAMES KNIGHT,
GEORGE FRANCIS DAWSON,
J. WILSON STRATTON,
CHAS. K. HAWKES,
WILLIAM HALL,
THOMAS HICKS,
GEORGE TIMPSON,
S. D. TILLMAN,
THOMAS RUTTER,
SAMUEL R. WELLS,
COR. H. DELAMATER,
HENRY J. NEWTON,
J. M. HARRIS,
J. V. L. NOTT,
ERASTUS W. SMITH,
EDWARD RICHMOND

## COMMITTEES.

Admission of Members—Charles E. Burd, J. Owen Rouse, John W. Chambers, John F. Cory, James H. Drake.

Finance—Thomas M. Adriance, Thomas Williams, Jr., Cyrus H. Loutrel, Charles Chamberlain, Simeon Baldwin.

Library—James K. Campbell, Edward S. Renwick, Dubois D. Parmelee, William Hibbard, Hamilton E. Towle.

Repository—James Bogardus, Albro Howell, Joseph Dixon, Nathaniel Wheeler, S. Starr Jocelyn.

Manufactures and Machinery—Miers Coryell, Warren Rowell, Charles E. Emery, Thomas D. Stetson, Hamilton E. Towle.

Chemistry, Mineralogy and Geology—Charles F. Chandler, Dubois D. Parmelee, Julius G. Pohlé, J. S. Newberry, John W. Morgan.

Civil Engineering and Architecture—R. G. Hatfield, Leopold Eidlitz, Samuel McElroy, Edwin Smith, H. F. Walling.

Agriculture—Nathan C. Ely, John Crane, P. T. Quinn, S. Edwards Todd, Josiah H. Macy.

Horticulture—William S. Carpenter, John Henderson, Benjamin C. Townsend, Isaac Buchanan, James Hogg.

Commerce—Edmund Dwight, Luther B. Wyman, Jireh Bull, James H. Sackett, John P. Veeder.

## FACULTY.

SAMUEL DYER TILLMAN, M. A., Professor of Mechanical Philosophy and Technology.

JULIUS G. POHLE, M. D., Professor of Analytical Chemistry.

ROBERT P. STEVENS, M. D., Professor of Geology and Mineralogy.

## REGENTS.

EDWIN D. MORGAN,
GERRIT SMITH,
ABIEL A. LOW,
EZRA CORNELL,
CORNELIUS VANDERBILT,
DENNING DUER,
SAMUEL F. B. MORSE,
HAMILTON FISH,
HENRY W. BELLOWS,
HENRY WARD BEECHER,
WILLIAM H. APPLETON,
ORLANDO B. POTTER,
JOHN A. GRISWOLD.

## REGENTS (Ex-Officio).

THE TRUSTEES OF THE AMERICAN INSTITUTE.
THE MAYOR OF THE CITY OF NEW YORK.
THE GOVERNOR OF THE STATE OF NEW YORK.
THE SECRETARY OF THE INTERIOR, U. S.

*Clerk and Librarian*, JOHN W. CHAMBERS.

*Messenger* - - - - RICHARD H. DALTON.

# COMMUNICATION TO THE LEGISLATURE.

*To the Honorable the Legislature of the State of New York:*

The undersigned, Trustees of the American Institute of the City of New York, respectfully submit, as their report for the year ending in April, 1868, the annexed documents, containing:

I. A Review of the Operations and Condition of the Institute, presented by the Board of Trustees at the meeting on the 6th day of February, 1868.

II. An Exhibit of the Receipts and Expenditures during the last Fiscal Year.

III. Reports of the several Standing Committees of the Institute.

IV. A Special Report from the Board of Managers, relating to the Strawberry Exhibition held on the 25th and 26th of June, 1867.

V. The Report of the Board of Managers on the General Exhibition held from the 12th day of September to the 26th day of October, 1867.

VI. A List of the Premiums awarded at the General Exhibition, together with Extracts from some of the Reports of the Judges upon which such awards were made.

VII. The opening and closing Addresses delivered at the Thirty-seventh Annual Exhibition.

VIII. Discussions at the weekly meetings of the Farmers' Club, including communications from all parts of the Union,

IX. Proceedings at the weekly sessions of the Polytechnic Association.

X. Minutes of the monthly meetings of the Photographical Section of the American Institute.

HORACE GREELEY *President.*
D. S. GREGORY,
O. B. POTTER,
CHAS. P. DALY,
FRANK MOORE,
SAMUEL D. TILLMAN,
S. R. COMSTOCK.

# ANNUAL REPORT OF THE BOARD OF TRUSTEES.

The board of trustees has the pleasure of reporting that the operations of the American Institute, during the past year, have been so important and successful as to warrant the hope that they will mark a new epoch in its history. The financial condition will be readily understood by a simple statement of the amount received from its principal sources of income, viz:

| | |
|---|---|
| 1. From members for admission fees and annual dues...... | $4,913 00 |
| 2. Rent of real estate (two quarters at $8,000 and two quarters at $20,000 per annnum)........................ | 14,000 00 |
| 3. Net proceeds of the thirty-seventh exhibition........... | 15,000.00 |
| 4. Annual appropriation by the State, for the encouragement of county agricultural fairs.......................... | 1,187 50 |
| Total........................................ | $35,100 50 |

From this must be deducted the annual taxes on the Broadway property, the cost of improvements lately made on the same, the full payment of the incumbrance which has been on this property since its purchase in 1849, amounting to $18,297.67, and the current expenses of the Institute; which left on the 31st of January, 1868, a balance in the treasury of $5,540.08. The details of receipts and expenditures will be found in the report of the committee on finance.

In accordance with a stipulation in the lease of the property of the Institute on Broadway and Leonard street, the building has been thoroughly repaired, and the cellar deepened, so as to make the basement available as a sales-room. About one-fourth of the cost of these improvements was paid by the occupant. The premises have again been let for the term of one year from the 1st of May next, for twenty thousand dollars, payable in quarterly instalments.

Although authorized by the Institute to sell the property for the sum of two hundred thousand dollars, the board has received no offer of that amount. The net income from the property, after deducting the amount paid for taxes and repairs, greatly exceeds the legal interest of the sum mentioned, and as real estate in the neighborhood is constantly increasing in value, not disposing of it at that price, may be considered as fortunate for the interests of the Institute. Should it become necessary, in providing the Institute with suitable permanent buildings for the holding of exhibitions, to spend at the outset a large sum of money, the property on Broadway might be sold for a satisfactory price, or should it be deemed best not to sell, there will be no difficulty in obtaining on it, by bond and mortgage, at least one hundred thousand dollars.

Several of the trustees have been engaged in examining various localities, with the view of providing a permanent place for the holding of annual exhibitions, and at an early day the board will make a special report on the subject.

The remarkable success attending the last exhibition, deserves especial notice. The board of managers embraced members of great experience in the business of conducting fairs, as well as those who for the first time acted in that capacity, and who doubtless had some new views in relation to the best course to be pursued. They seemed to have been entirely harmonious in their deliberations, and their combined wisdom in giving efficiency to the new by-laws of the Institute, relating to exhibitions, has resulted in a return of profits more than twice as large as that from the most successful of all previous fairs, that of 1849. To fully appreciate the importance of this result, it is only necessary to state, that by the exhibitions of the years 1853, 1859, 1860 and 1863, the Institute lost $13,128.94; that the total surplus from all of the exhibitions from the years 1851 to 1867, was $25,370.26, the losses within the same period being deducted from this sum, the actual gain is found to be $12,241,32; now if we add the State appropriation, which has latterly been included in making up the final balance sheet of profits, the actual surplus derived from the exhibition of 1867, is shown to be $16,187.50; an amount nearly four thousand dollars greater than that derived from all the fairs held by the Institute for the past sixteen years.

Not less gratifying is the present aspect of other departments of the American Institute. The Farmers' Club has met regularly during the past year, and disseminated through various journals which report its weekly proceedings, a vast amount of useful knowledge relating to practical agriculture. The Polytechnic Association has never failed to assemble at the appointed hour to examine new inventions and discoveries, and to contribute its share towards the advancement of the sciences and their application to the arts.

During the past year the American Photographical Society decided to relinquish its distinct existence and become a part of this Institute, under the title of the "Photographical Section." Its organization has, by a vote of the Institute, been placed in charge of the committee on chemistry and mineralogy. A reference to the report of the library committee will show that valuable additions of books have been lately made, and that the interest in the reading department of the Institute is steadily increasing.

The great accession of new members is, perhaps, the most gratifying fact in the history of the past year. It indicates that the Institute is rapidly becoming more attractive, and offering new inducements to men of all ranks of society for enlisting in the cause which has for its ultimate object the diffusion of useful knowledge and the increase of the material resources of every part of the whole country.

All of which is respectfully submitted.

New York, *February* 6, 1868.

HORACE GREELEY, *President.*
DUDLEY S. GREGORY,
O. B. POTTER,
S. R. COMSTOCK,
S. D. TILLMAN,
*Trustees*

# REPORTS OF COMMITTEES.

## FINANCE.

*Receipts and disbursements of the American Institute of the City of New York, for the year ending January* 31, 1868.

| | | |
|---|---|---|
| Balance in the treasury, January 31, 1867 | | $1,346 11 |
| RECEIPTS. | | |
| Rental of property | $14,000 00 | |
| Admission fees, dues and life members | 4,913 00 | |
| Managers of the Thirty-seventh Annual Fair | 15,000 00 | |
| State appropriation, 1866 | 1,187 50 | |
| Miscellaneous sources | 227 22 | |
| | | 35,327 72 |
| | | $36,673 83 |
| DISBURSEMENTS. | | |
| Repairs, and commission renting property | $2,325 90 | |
| Taxes and insurance | 2,705 51 | |
| Balance of bond and mortgage | 17,000 00 | |
| Interest on bond and mortgage | 1,301 45 | |
| Trial of hay forks and strawberry exhibiton | 105 71 | |
| Books, periodicals and binding | 378 73 | |
| Printing and stationery | 233 54 | |
| Rent of room, at Cooper Union, and gas | 2,004 96 | |
| Freight and expenses Transactions, from Albany | 62 75 | |
| Reporting Polytechnic Association | 40 00 | |
| Restriking medals | 12 75 | |
| Salaries | 4,364 00 | |
| Newspapers, advertising, postages and incidental expenses | 598 45 | |
| | | 31,133 75 |
| Balance in bank, January 31, 1868 | | $5,540 08 |

THOMAS M. ADRIANCE,
THOMAS WILLIAMS, JR.,
CYRUS H. LOUTREL, *Finance Committee*
NATHAN C. ELY,
CHARLES CHAMBERLAIN,

## AGRICULTURE.

The committee on agriculture of the American Institute beg leave to report: That they have great pleasure in informing the Institute that the Farmers' Club, which is placed under their immediate direction, is increasing in interest. There are now in attendance at its meetings, representatives from six of the principal papers published in our city, so that the reports of the discussions and communications reach every part of our country.

One important feature of the Club, during the past year, was the trial of several farm implements, among which was the trial of horse hay forks, in Westchester county, N. Y., which occupied two days, and was of great interest, showing by actual experiment the working of some twenty different modifications of this implement, which has come into use within the past few years, and one that is deemed of such vast importance to the farmers, when we take into account that the hay crop in the United States, according to the last census, amounted to over nineteen millions of tons.

The committee feel confident in asserting that the greatest results are realized from deep tillage, and by this means larger crops are produced with much less expense; and we think that a person who cultivates ten acres twenty inches deep, will grow rich in eight cases out of ten, while he who cultivates twenty acres ten inches deep or less, will not often succeed in farming pursuits. Farmers in general will be found to have under culture twice as many acres as their capital or ability, if consulted, would dictate.

Among our American farmers, manures, and the best modes of application, are not well understood, and we are too apt, as a class, to give a great many acres a scanty supply, rather than giving a full supply to a few acres. By a rule adopted last December, it was decided to have a paper read at each meeting of the Club, and the following gentlemen were appointed to prepare them:

*Farm Buildings*—Mr. S. Edwards Todd. *Germination of the Potato*—Dr. F. M. Hexamer. *Pasture Lands of the South*—Mr. Joseph B. Lyman. *Clover as a Fertilizer*—Dr. J. E. Snodgrass. *Raspberry*—Mr. Thomas Cavenach. *Mowing and Reaping Machines*—Mr. James M. Allen. *Manures*—Mr. P. T. Quinn. *Importance of Planting Forest Trees*—Mr. A. S. Fuller. *Necessity of a General Railroad Law for the Benefit of Agriculture*—Dr. Isaac P. Trimble.

The list will be extended from time to time, as subjects suggest themselves.

During the past year the correspondence of the Club has been very extensive; the Secretary, Mr. Chambers, has received over twelve thousand communications, asking for information connected with agricultural pursuits, for seeds, &c., and giving the experience of the writers on their mode of cultivation, &c. The most important of these letters are condensed in the reports, and will be found in the Transactions of the Institute. These letters were received from twenty-eight different States, showing how extensively the reports of the Club have been circulated.

The committee take great pleasure in stating that Mr. Nathan C. Ely, the permanent chairman, has presided with marked ability at most of the meetings, which have been held every Tuesday during the year. During his temporary absence, Prof. Tillman has officiated in his stead.

Your committee cannot close this report without alluding to the death, in July last, of their associate, and chairman of the committee of agriculture, Mr. John G. Bergen, who had for many years been a faithful attendant at the meetings of the Club, and whose experience on agriculture was always listened to with respect and great benefit.

All of which is respectfully submitted.

New York, *February 4th*, 1868.

P. T. QUINN,
JOHN CRANE,
S. EDWARDS TODD, } *Committee.*

## HORTICULTURE.

Your committee have watched with much interest the progress of this branch of domestic industry, which contributes so largely to our luxuries as well as our necessities. They have been gratified to perceive no interruption to improvement in the excellence and beauty of both fruits and flowers; but they cannot help adding that too many varieties of both get before the public not only without sufficient merit of their own, but without such an endorsement from competent bodies as is calculated to win and justify public confidence. There can be no doubt, not only that very large sums of money are yearly wasted in this way, but that the progress of horticulture is needlessly impeded. The evil has got to be of such magnitude, that the feeling has become quite general, that a remedy of some kind is imperative. The question arises, whether it is not within the scope and duty of the American Institute to do something to correct this evil. Your committee are of opinion that it is, and that the subject should be referred to a competent committee for consideration. We have too many novelties and too few means for ascertaining their real merit.

The great strawberry show held in our rooms last June, may be taken as evidence, that the interest felt in the improvement of of this delicious fruit, remains unabated. Large numbers of new kinds, noted for their size and productiveness were brought together from various parts of the country, and these together with many samples of the good old varieties, made a very interesting exhibition. The season, however, in the vicinity of New York, was so wet and unfavorable as not to warrant any safe deductions as to the actual merits of most of the new kinds, and the same remark will hold equally true of apples, pears, peaches, grapes, &c., which were mostly flat and insipid in flavor. It is interesting, however, to note in this connection, the compensating advantages of a variety of climate, such as we enjoy; though a crop may be very poor and worthless in one section, or even entirely fail, it is quite sure to be abundant and excellent in some other; and we shall thus always, probably, with our rapid modes of intercommunication, be secure from the evils of famine. It may be remarked here, in a general way, that notwithstanding the supply of fruit is nearly doubled each year, it is not yet equal to the demand; and this will without doubt continue to be the case till the taste for choice fruit has become prevalent among all classes of people, or rather perhaps till fruit has become so abundant and cheap that all classes can afford to use it freely. Your committee are of opinion that the Institute should give proper encouragement to monthly exhibitions of fruit and flowers, by which means the best kinds in their seasons would be presented to the public for examination, and their taste and knowledge thus improved, while at the same time the grower would be benefited to an equal extent in a pecuniary point of view. The benefit to the Institute would be quite as great as to either of the other parties, since it would keep it more constantly before the public and thus popularize it, and that would seem to be an end very much to be wished.

It may be remarked here, that grape culture has already got to be one of the largest and most remunerative departments of fruit culture, and it is gratifying to know that nearly every section of our vast country is more or less adapted to the successful culture of this important fruit. What is chiefly wanted now is correct knowledge of the habits of the vine, and of the best modes of culture and training, without which success becomes a mere matter of chance.

The interest in fruit culture has been much increased by the discovery of Mr. Nyce, by means of which he has been enabled to erect houses, in which fruit may be kept in sound condition for several months after being gathered, some kinds, indeed, such as the apple and pear, for a year or more. One of these houses has been erected in New York, and from it our market is now being supplied with sound grapes, as well as apples and pears out of their season, of which the Bartlett may be mentioned as an example of the last. This supply can be continued during the year. The fruit retains a great degree of its original freshness and flavor. The importance and value of such fruit preservatories will be readily appreciated.

While it is not to be expected that all the members of the Institute should feel the same degree of interest in horticulture that your committee do, they still cannot help urging the importance of extending to this branch of domestic industry a full share of encouragement, being convinced that such a course would benefit the Institute quite as much as the public. Horticulture, hitherto, has not been encouraged, or at least appreciated in New York, to the same degree that it has in other large cities. Your committee simply state the fact without attempting to account for it. It is to be hoped that in the new building, which the Institute proposes soon to erect, ample provision may be made for the growth and exhibition of rare and beautiful plants; a place where the products of the gardener's skill may be exhibited without certain ruin during the first twenty-four hours. A place is wanted where plants, &c., may not only be shown without damage, but where the public may examine them conveniently and well. Such a place it would not be difficult to provide in any new building the Institute may erect.

All of which is respectfully submitted.

NEW YORK, *February* 6, 1868.

WM. S. CARPENTER,
ISAAC BUCHANAN, } *Committee.*
B. C. TOWNSEND,

## MANUFACTURES AND MACHINERY.

The committee on manufactures and machinery beg leave to report:

That the division of labor resulting from the formation, under the new by-laws, of several committees to take the place of the committee on "Manufactures, Arts and Sciences," has greatly lessened the duties of members of standing committees. But few new inventions, belonging to the class of manufactures and machinery, have been referred to your committee for examination during the past year. The small number of articles referred to it does not result from any diminution in the number of new inventions, but from the fact that inventors can more readily obtain action on their productions by bringing them before the Polytechnic Association, or by placing them in the annual exhibitions of the Institute, side by side with others of the same class, where their comparative merits will be passed upon by disinterested judges.

The Polytechnic Association, placed under the supervision of your committee, was organized for the year by the reappointment of Prof. S. D. Tillman, as chairman, and J. Wyatt Reid, as secretary. The duties of the chair have been faithfully and satisfactorily performed. No other business or engagement has, in a single instance, prevented the chairman from attending its meetings. He has aimed to furnish at every session a summary of the progress of invention and discovery, particularly in foreign countries. One of the most important objects of the Polytechnic branch of the Institute is to give every inventor, whether he is a member of the Institute or not, the opportunity of bringing his device before a body competent to point out all its merits and defects, and thus to be a real service to the inventor, as well as to that portion of the public who are interested in labor-saving machines. A large number of new and useful articles, and improved processes of manufacture, have been presented and explained before the Association during the past year; and many of their proprietors have acknowledged the benefits which they have derived from the criticisms which have been elicited by such presentations. The free interchange of ideas at these meetings is the strongest argument in favor of allowing strangers to participate in the debates. In some instances, the dignity of the discussion may fall below the standard of scientists, but the utterance of one new thought or suggestion, couched in the homliest phrase, is of far more value than the repetition of old ideas, although dressed in the most attractive forms of speech. The attendance at the Polytechnic weekly meetings has been uniformly large. On several occasions many have been unable to gain admittance, and your committee again suggest the expediency of providing a larger room for the accommodation of this branch of the Institute.

All of which is respectfully submitted.

NEW YORK, *February* 5, 1868.

WARREN ROWELL, *Chairman.*

MIERS CORYELL, *Secretary.*

## CHEMISTRY, MINERALOGY AND GEOLOGY.

The committee on chemistry, mineralogy and geology of the American Institute, respectfully report:

That the committee was organized March 25, 1867, by the election of Charles A. Joy as chairman, and R. P. Stevens as secretary. On the 25th of May, 1867, they met to receive a communication from the American Photographical Society, and on that occasion organized a Photographic Section of the Institute by the appointment of the following officers: Lewis M. Rutherfurd, President; John W. Draper, 1st Vice-President; Charles A. Joy, 2d Vice-President; Abram Bogardus, 3d Vice-President; Charles Wager Hull, Corresponding Secretary; Oscar G. Mason, Recording Secretary; Henry J. Newton, Treasurer.

The property of the old society, consisting of many valuable photographs, daguerreotypes, books and objects relating to the history of the art were brought to the Institute, where they are now stored. Some of the specimens in the collection are of the greatest historical value, as they go to show that daguerreotype portraits were taken in this country as early as 1839. Other specimens prove that microscopic photography, for the illustration of scientific works, was early practiced by members of the American Institute, and afford incontestible evidence that the members of this body bore a prominent part in founding an art which has become of such vast importance to mankind.

Your committee, therefore, trust that the Institute will appreciate the value of the photographic collection, and will take measures to save it from injury or dispersion.

The meetings of the Photographic Section have been held once a month, with the exception of the summer vacation and the time of the annual fair. They have been attended by the principal amateur and professional photographers of the city, and the discussions have elicited many new facts in this department of art.

The proceedings have been widely circulated in American and foreign journals, and will constitute an important addition to the printed volume of Transactions of the Institute.

No process or invention relating to chemistry, mineralogy or geology has been referred by the Institute to your committee for examination or analysis, but the members of the committee were active during the time of the fair in serving on juries of experts, and in promoting the success of the department entrusted to their charge.

All of which is respectfully submitted.

New York, *February* 6, 1868.

CHARLES A. JOY, *Chairman.*

## ADMISSION OF MEMBERS.

The committee on the admission of members, beg leave to submit the following report of their proceedings during the past year:

The committee, in making their annual exhibit, take great pleasure in announcing to the members of the Institute the unprecedented number of candidates that have made application for membership during the past year; never in the history of this Institution has there been such an increase of members.

In the year 1866, the number admitted was 240; in 1867, 407; being an increase of 167 over the previous year, and making for the two years, 647.

The above statement must be very gratifying to those who are working so assiduously for the welfare of the Institute; such increasing numbers mark a new era in the annals of the American Institute; it certainly shows that the Institute is rapidly progressing in its sphere of usefulness.

The committee would respectfully remind the members of the necessity of carefully considering the names of new candidates which they endorse, and thereby make them a source of strength instead of weakness to the structure which is being raised for this and future generations; oftentime an increase too rapid is detrimental to a healthy growth, but if that growth is of a proper kind there need be no fear of its future prosperity.

The annual fairs generally brings a large increase of members; during the last exhibition 199 propositions were received through the board of managers; these on the 7th day of November, were admitted as members of the Institute.

The committee have, at each stated meeting, reported upon the names of the candidates submitted to them, showing their occupations, residences, and by whom endorsed.

The number admitted during the year, are as follows:

| | |
|---|---|
| March 7, 1867 | 31 |
| April 4, 1867 | 17 |
| May 2, 1867 | 15 |
| June 6, 1867 | 23 |
| September 5, 1867 | 89 |
| November 7, 1867 | 199 |
| December 5, 1867 | 13 |
| January 2, 1868 | 7 |
| February 6, 1868 | 13 |
| Total | 407 |

The following is the number of members belonging to the Institute:

| | | |
|---|---|---|
| Honorary | | 85 |
| Corresponding | | 248 |
| Life members | 1,200 | |
| Less deceased | 220 | |
| | | 980 |
| Annual members | | 1,064 |
| Total | | 2,377 |

All of which is respectfully submitted.

NEW YORK, *February* 6, 1868.

CHARLES E. BURD,
JAMES H. DRAKE,
JOHN W. CHAMBERS,
JOHN F. CORY,
} *Committee*

# REPORT OF THE BOARD OF MANAGERS

RELATIVE TO THE

## STRAWBERRY EXHIBITION.

The board of managers respectfully report that, in conformity to a resolution of the Institute, passed April 4, 1867, an exhibition of strawberries was held in the rooms of the Institute on the 25th and 26th days of June last. The following circular was issued:

The managers announce that an attractive exhibition of strawberries and hot house grapes, will be held at the rooms of the Institute, in the Cooper Building, Fourth avenue and Eighth street, New York city, on Tuesday and Wednesday, June 25th and 26th.

THE FOLLOWING SPECIAL PREMIUMS WILL BE AWARDED:

Premium offered by the Hon. Horace Greeley, $50: For the best seedling, never before exhibited, which shall be as large as the Wilson, of equal productiveness and of better quality. The fruit must be firm, and a good market variety; the plant (to be exhibited with the fruit) must be vigorous and hardy, having perfect flowers. This seedling must be submitted for examination this year and next.

Premium offered by the Hon. Dudley S. Gregory, $50: For the best collection, not less than fifteen, of named varieties in bearing, to be exhibited in pots not more than ten inches in diameter.

Premium offered by Orlando B. Potter, Esq , $50: For the best collection, not less than thirty, of named varieties, one pint each.

Premium offered by Salem H. Wales, Esq., $25: For the best collection, not less than twenty, of named varieties, one pint each.

Premium offered by William H. Butler, Esq., $12: For the best collection, not less than twelve, of named varieties, one pint each.

Premium offered by Nathan C. Ely, Esq., $6: For the best collection, not less than six, of named varieties, one pint each.

Premium offered by William S. Carpenter, Esq., $10: For the best new variety never before shown, to be exhibited in bearing in a pot not more than ten inches in diameter. It must be of large size, good quality, prolific, and a good market variety.

For the best plant (in fruit) of any kind, to be exhibited in a pot not more than ten inches in diameter, $5. For the three heaviest berries, $3.

Premiums offered by the Board of Managers:

| | | | |
|---|---|---|---|
| For the best | quart of | Agriculturist | $3 00 |
| do | do | Austin | 3 00 |
| do | do | Durand's Seedling | 3 00 |
| do | do | French's Seedling | 3 00 |
| do | do | Golden Queen | 3 00 |
| do | do | Green Prolific | 3 00 |
| do | do | Hovey's Seedling | 3 00 |
| do | do | Ida | 3 00 |
| do | do | Jucunda | 3 00 |
| do | do | La Constante | 3 00 |
| do | do | Lennig's White | 3 00 |
| do | do | Mead's Seedling | 3 00 |
| do | do | Metcalf's Early | 3 00 |
| do | do | Philadelphia | 3 00 |
| do | do | Rippowam | 3 00 |
| do | do | Russell's Prolific | 3 00 |
| do | do | Triomphe de Gand | 3 00 |
| do | do | Wilson's Albany | 3 00 |
| For the best strawberry box or basket for marketing strawberries, considering price and durability | | | 5 00 |

Premium offered by William H. Vanderbilt, Esq., $25: For the best six varieties of hot house grapes, two bunches of each.

The fruit must be on the tables by 2 o'clock, p. m., on Tuesday, the 24th of June. Each kind must be correctly named. It is expected that the exhibitors will show the exact quantity specified, neither more nor less. A deficiency will disqualify for a prize.

Plants exhibited in pots must be in good condition, and not drooping, or wilted, from being lifted. No tubs will be allowed in the exhibition.

The judges will meet on Tuesday, the 24th day of June, at 3 o'clock p. m., to make their examination. No persons will be allowed in the rooms during the examination by the judges. The exhibitor's name must not appear on the specimens until after the examination. The prizes will be attached to each lot as soon as the judges have finished their labors.

The exhibition will be opened to the public at 7 o'clock p. m., on Tuesday, June 24th, and remain open until 10 o'clock p. m., on Wednesday, June 25th.

The prize fruit will be at the disposal of the managers at the close of the exhibition. Dishes will be provided by the managers. Persons intending to exhibit will please to give at least one week's notice to the secretary, so that the necessary arrangements may be made.

The judges will be Messrs. John Ellis, Thomas Meehan, J. J. Thomas and Geo. Thurber.

Fruit from a distance may be addressed, prepaid, to the care of John W. Chambers, secretary of the managers, American Institute, No. 22 Cooper Building, and will be properly placed on the tables.

The days first designated for the exhibition was the 18th and 19th days of June, but from the lateness of the season, the committee deemed it expedient to defer it a week later.

Competent judges of strawberries assert that the exhibition of superior berries and fine plants in pots, exceeded any show of the kind ever made in this country, and the managers congratulate the Institute on being the means of bringing this fine collection to the notice of the public.

The following is the official list of premiums awarded:

For the Greeley prize no award was made, there being no berry, in the opinion of the committee, filling all the requirements. Several fruits of great promise were offered for this prize, among which were: No. 18, "Charles Downing," presented by Mr. J. S. Downer, Todd county, Kentucky, a seedling of remarkable size and beauty; No. 7, a seedling presented by Mr. Seth Boyden, Newark, N. J., being No. 30 of his seedlings; No. 1, Romeyn's Seedling, presented by Mr. Wm. H. Romeyn, Kingston, Ulster Co., N. Y., a very prolific variety; and No. 20, Durand's Seedling, presented by Francis Brill, Newark, N. J.

Before this premium can be awarded according to the terms specified, the plants should be examined on the ground, to ascertain how they wintered, and again in fruiting time, by a committee appointed for this purpose.

Premium offered by Hon. D. S. Gregory, $50, to Reisig & Hexamer, Newcastle, Westchester Co., N. Y., for the best collection of 20 named varieties in bearing.

Premium offered by Selene H. Wales, Esq., $25, to Reisig & Hexamer, Newcastle, Westchester Co., N. Y., for the best collection of named varieties (not less than 20), one pint of each.

Premium offered by Wm. H. Butler, Esq., $12, to Francis Brill, Newark, N. J., for the best collection of named varieties (not less than 12), one pint of each.

Premium offered by Nathan C. Ely, Esq., $6, to E. Williams, Montclair, N. J., for the best collection of named varieties (not less than six), one pint of each.

| | |
|---|---|
| S. Springstead, Union Port, N. Y., for the best plant in fruit, of any kind, (Agriculturist) | $5 |
| S. Springstead, Union Port, N. Y., for the three heaviest berries (Agriculturist) | 3 |
| G. M. Betts, Stamford, Conn., for the best quart of Agriculturist | 3 |
| Francis Brill, Newark, N. J., for the best quart of Austin | 3 |
| Francis Brill, Newark, N. J., for the best quart of Durand's seedling | 3 |
| Francis Brill, Newark, N. J., for the best quart of Green Prolific | 3 |
| E. Williams, Montclair, N. J., for the best quart of Ida | 3 |
| Francis Brill, Newark, N. J., for the best quart of Jucunda | 3 |
| Francis Brill, Newark, N. J., for the best quart of Lennig's White | 3 |
| J. W. Faulkner, Stamford, Conn., for the best quart of Rippowam | 3 |
| E. Marshall, Poughkeepsie, N. Y., for the best quart of Russell's Prolific | 3 |
| Mrs. R. A. Kerr, Marlborough, N. Y., for the best quart of Triomphe de Gand | 3 |
| E. Marshall, Poughkeepsie, N. Y., for the best quart of Wilson's Albany | 3 |
| A. Beecher & Sons, Westville, Conn., for the best strawberry basket | 5 |

Orestes Cleveland, Jersey City, N. J., exhibited the best quart of La Constante, but being a manager, is debarred from receiving a premium.

### EXPENSES OF THE EXHIBITION.

| | | |
|---|---|---|
| Printing circular and tickets | | $21 50 |
| Advertising | | 8 90 |
| Postages, services of doorkeeper, and sundry expenses | | 23 98 |
| | | $54 38 |
| Premiums awarded | $139 00 | |
| Less contributed by Messrs. Gregory, Wales, Butler and Ely, | 93 00 | |
| | | 46 00 |
| | | $100 38 |
| Cash received at the door | $38 25 | |
| from Treasurer of the Institute | 62 13 | |
| | | $100 38 |

WILLIAM H. BUTLER,
THOMAS McELRATH,
GEORGE PEYTON,
J. GROSHON HERRIOT,
ROBERT G. HATFIELD,
WILLIAM S. CARPENTER,
ORESTES CLEVELAND,
CHARLES G. HALPINE,
WILLIAM H. HICKS,
J. OWEN ROUSE,
CHARLES WAGER HULL,
THOMAS HICKS,
LLOYD ASPINWALL,
CHARLES G. SMULL,
NATHAN C. ELY,
DAVIS COLLAMORE,
LEWIS FEUCHTWANGER,
JAMES KNIGHT,
FRANK MOORE,
J. WILSON STRATTON,
CHARLES K. HAWKES,
ISAAC WALTON,
GEO. FRANCIS DAWSON,
SAMUEL D. TILLMAN,
*Managers*

JOHN W. CHAMBERS, *Secretary*.

# REPORT OF THE BOARD OF MANAGERS.

The Board of Managers of the Thirty-seventh Annual Exhibition of the American Institute respectfully submit the following:

The board was duly organized on the 25th day of February, 1867, by the election of William H. Butler as chairman, Thomas McElrath as vice-chairman, and John W. Chambers as secretary.

Early in June, the managers announced that an exhibition of stawberries and hot-house grapes would be held at the rooms of the Institute. A number of special premiums were offered by several of the trustees and managers, which had the effect of bringing together a large number of competitors. The exhibition opened on the 25th of June, and continued for two days. It is believed that in respect to size, quality, and number of varieties, this show of strawberries has never been surpassed in this country.

A full account of berries and plants exhibited, and the awards made, will be found in a preceding report.

In accordance with the opinion very generally expressed in favor of holding an autumnal exhibition, the board early took the initiatory steps in relation to procuring a suitable building for that purpose. After it had been decided that an exhibition building could not be erected by the Institute and completed in time for occupation in the fall, the board directed its attenton to securing suitable premises for a short term. A careful survey of various localities, by a committee appointed for that purpose, resulted in a report that no more commodious buildings could be found than the armory of the Twenty-second regiment N. G., S. N. Y., on Fourteenth street, when enlarged by certain permanent and temporary structures. Accordingly, on the 26th day of June, 1867, an agreement was made with that regiment whereby, in consideration of the use of the armory during a portion of the months of September and October, the board bound itself to lay a new and superior floor over the whole of the great hall, to construct on the north and south sides large galleries, and make other improvements specified, the whole of which were estimated to cost about six thousand dollars.

In addition to this work, which was done by Messrs. Hunt & Son, the board were obliged to erect on Fifteenth street, a temporary structure extending along the whole width of the armory, and covering a portion of the sidewalk, for the accommodations of the boilers which were to furnish steam for driving the numerous machines to be set in motion, a certain portion being reserved as a restaurant.

In the meantime, circulars were issued by the board announcing that the grand autumnal exhibition of the American Institute would open on the 12th day of September, and close on the 26th day of October. The rules and regulations adopted by the board and the classification of the articles to be exhibited, adopted by the Institute, were also published.

Although inventors, manufacturers, and producers generally had but a little more than two months for preparation, the letters received by the corresponding secretary, and containing applications for space, were soon so numerous the board were convinced that the premises provided would be too small to accommodate all who were desirous of becoming exhibitors. It, therefore, early became necessary to refuse admission to certain classes of manufactures, such as carriages, &c., each of which required considerable room, and to restrict the exhibitors of working machines to the use of only such space as was absolutely required. Within a short time after the day designated for the reception of goods, every part of the building was filled. It seemed as though all available space was occupied, yet the subsequent reception of articles from a distance, which had been delayed on railways and for other unavoidable causes, rendered further contractions of allotted space necessary, which was generally submitted to by exhibitors, who, by this and other acts, evinced their willingness to ensure the general success of the exhibition.

A reference to the by-laws adopted by the board will show how, by a proper division of labor, the arduous duties of the management were performed. It is only to be regretted that the continued absence of several of the managers threw an unexpected burden on the remaining members of the board.

The whole available space, after laying out the passages and avenues to be used by visitors, was appropriated proportionally to seven departments, each of which was subdivided into seven groups. Each department was placed under the absolute control of a committee of three members, it being understood that the chairman of each committee was mainly responsible for its action. By the adoption of this course it was found in practice that a vast amount of work was performed without any serious clashing of authority.

The experiment of arranging the exhibition according to the complete classification of articles, adopted by the Institute, was made for the first time by the present board; and, although at the outset some doubts were entertained as to its working well in all respects, the actual experiment has demonstrated that it is of great service, not only to visitors seeking the locality of any article, and to exhibitors who find themselves side by side with their competitors, but chiefly to the board of managers, who find that systematic arrangement is conducive to order, and enables them to detect at a glance any infringement which tends to disturb the general harmony.

In addition to the departmental committees, seven more were organized, on which devolved the general business of the exhibition. These were: 1st, on finance; 2d, on tickets; 3d, on printing and invitations; 4th, on carpenter work; 5th, on police, light, music and decorations; 6th, on stands and refreshments; 7th, on the reception of goods.

It might be deemed invidious to mention those who have been most prominent in the discharge of their official duties, since the whole history of the management will show that each active member has devoted to it all the time and service which his individual business did not imperatively require.

The exhibition was opened on the day first appointed, by an address from the President of the Institute, the Hon. Horace Greeley, who commanded the undivided attention of a vast audience for an hour, in an able exposition of the claims of labor and creative art, concluding with a clear statement of the aim and objects of the American Institute, and the importance of early securing for it a structure commensurate with its wants.

The display opened under the best auspices, and having been early pronounced by the press and public to be superior in extent, variety and attractiveness to any former exhibition, its success was insured from the first. A constant succession of clear sunny days, continuing, with a few exceptions, to the close, doubtless aided in securing a large attendance, which was generally increased during the evening to such an extent as to deprive many of an opportunity of examining with care the most interesting inventions.

Every department teemed with novelties, and nearly every group contained specimens of the articles which had been assigned to it in the classification.

The department of engines and machinery occupied the largest share of space, and was mostly filled with new inventions.

In the department of fine arts and education, among the most noticeable features were the photographic displays, pianos, and optical instruments.

The department of the dwelling contained almost every conceivable device for lessening the severity of domestic labor, table utensils, furniture, and many ornaments for the house.

Among the many novelties in the department of dress and handicraft, were the latest inventions for sewing and knitting.

The department of chemistry and mineralogy contained many new specimens and preparations.

The small space allotted to the department of intercommunication was overcrowded with novelties relating to railways, common roads, navigation, trade, telegraphs, printing, and public structures. That which attracted most attention being the full-sized pneumatic railway, extending across the building, and built expressly by the projector for this exhibition, at a cost of nearly six thousand dollars.

The display of plants, vegetables, fruits and flowers, in the department of agriculture and horticulture, was very creditable, while the number of new and useful farming implements was quite large, considering no opportunity could be given for testing their merits.

In addition to fine instrumental concerts given each evening, a musical treat was provided during a portion of each day, by the performance of a mechanical or automatic organ called the "Orchestrion."

With regard to the award of premiums, it may be said that unusual care was taken in the selection of judges, among whom were found some of the leading scientific men of this and neighboring cities. The duty of testing machines and instruments, analyzing chemical compounds, examining in detail works of art and useful implements, was performed, generally, with unusual scrutiny and impartiality; and although, in some few cases, their judgments have, as might have been expected, given offence, and for which the board of managers have been blamed without cause, since the laws of the Institute forbid their interference in relation to the comparative merits of competing articles, yet they cannot let this occasion pass without placing on record its opinion that the thanks of the Institute are eminently due to the judges of the thirty-seventh exhibition. After a season of unexampled success, the pleasures of which were marred only by accidents to persons having charge of machinery, one of which resulted fatally, the exhibition was terminated on the evening of the 26th of October, by the award of premiums, viz:

| DEPARTMENTS. | PREMIUMS. | | |
|---|---|---|---|
| | First. | Second. | Third. |
| 1. Of Fine Arts and Education | 21 | 20 | 31 |
| 2. Of the Dwelling | 7 | 33 | 49 |
| 3. Of Dress and Handicraft | 19 | 21 | 30 |
| 4. Of Chemistry and Mineralogy | 22 | 18 | 9 |
| 5. Of Engines and Machinery | 21 | 75 | 62 |
| 6. Of Intercommunication | 30 | 6 | 3 |
| 7. Of Agriculture and Horticulture | 14 | 19 | 12 |
| Total | 134 | 192 | 196 |

The closing address was made by the Rev. Henry Ward Beecher, and was listened to by as many as could press within the sound of his voice. His stirring appeal in favor of fostering the inventive genius and mechanical skill of America, as applied in the workshop and the field, made a deep impression, and will be long remembered by those who heard it as giving new assurance that the eloquence of the highest order will be always arrayed on the side of material progress.

The receipts and expenditures of the exhibition have been as follows:

RECEIPTS.

| | | |
|---|---|---|
| To cash from treasurer of the American Institute, appropriated June 6, 1867 | | $5,000 00 |
| To cash received at the strawberry exhibition. | $38 25 | |
| To cash from treasurer of the American Institute, on account of strawberry exhibition, appropriated April 4, 1867 | 62 13 | |
| | | 100 38 |
| | | $5,100 38 |
| To cash total receipts at the door, including season, mechanics', hotel, excursion and school tickets | $36,599 60 | |
| To cash for stands, privileges, restaurant, catalogue, &c. | 2,412 84 | |
| To cash sales of lumber, bulletin boards, &c. | 75 60 | |
| | | 39,088 04 |
| Amount to be accounted for | | $44,188 42 |

### EXPENDITURES.

| | | | |
|---|---|---|---|
| By committee on finance, ticket seller | | $195 00 | |
| By committee on tickets, ticket receiver | | 165 50 | |
| By committee on printing and invitations, printing, advertising, posting, badges, &c | | 3,907 94 | |
| By committee on location, new floor, galleries, &c | | 5,581 40 | |
| By committee on carpenters' work, labor and materials, fitting sheds, &c | | 1,958 31 | |
| By committee on police, light, music and decorations: | | | |
| Floor clerks | $725 50 | | |
| Night watch | 409 00 | | |
| Laborers | 540 63 | | |
| Light, gas, &c | 1,555 59 | | |
| Music | 1,365 00 | | |
| Decorations | 281 45 | | |
| | | 4,877 17 | |
| By committee on stands and refreshments, refreshments for managers, judges, &c | | 811 67 | |
| By committee on engines and machinery: | | | |
| Use of boilers, steam and gas pipes, &c | $2,200 28 | | |
| Fuel | 1,002 25 | | |
| Engineers, assistants and labor. | 1,497 62 | | |
| | | 4,700 15 | |
| By committee on fine arts, &c., cartage and hanging pictures | | 40 30 | |
| On account of premiums, medals, diplomas, &c. | | 597 95 | |
| On account of strawberry exhibition | | 100 38 | |
| Miscellaneous bills, including clerk hire, cartage, cleaning, insurance, &c., &c | | 1,036 69 | |
| | | | 23,972 46 |
| Total expenditures | | | $20,215 96 |
| By cash repaid treasurer American Institute... | | $5,000 00 | |
| By cash treasurer American Institute, estimated surplus | | 15,000 00 | |
| | | | 20,000 00 |
| Leaving a balance in hand this day | | | $215 96 |

A detailed account has been examined by the finance committee of the Institute, with the vouchers, in accordance with article 10, section 22 of the by-laws, and has been found correct.

All of which is respectfully submitted.

New York, *February* 5, 1868.

WILLIAM H. BUTLER,
THOMAS McELRATH,
GEORGE PEYTON,
WM. S. CARPENTER,
NATHAN C. ELY,
LEWIS FEUCHTWANGER,
ORESTES CLEVELAND,
J. GROSHON HERRIOT,
JAMES KNIGHT,,
ISAAC WALTON,
WM. H. HICKS,
CHAS. WAGER HULL,
SAMUEL D. TILLMAN,
THOMAS HICKS,
GEO. FRANCIS DAWSON,
ROBERT G. HATFIELD,
J. OWEN ROUSE,
FRANK MOORE,
J. WILSON STRATTON,
CHARLES K. HAWKES,
CHARLES G. SMULL.

# LIST OF PREMIUMS

## AWARDED AT THE 37TH ANNUAL FAIR OF THE AMERICAN INSTITUTE, OCTOBER, 1867.

**[In numerous cases where the first medal is not mentioned, the second medal indicates that the article for which it was awarded was the best on exhibition.]**

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## I.—DEPARTMENT OF FINE ARTS AND EDUCATION.

*Under the Supervision of Messrs.* Thomas Hicks, George Peyton *and* J. Owen Rouse.

First Group.—Paintings on canvas, glass and other surfaces; pastels, cartoons, miniatures.

Second Group.—Engravings, lithographs, chemical etchings, plain and colored, enamel work, designs and drawings relating to architecture and civil engineering.

Third Group.—Photographs, plain and colored, daguerreotypes, ambrotypes; all other impressions by the action of light.

Fourth Group.—Sculpture, cameos, medals, medallions, bas relief, embossed work, fine castings in bronze, zinc, and other metals.

Fifth Group.—Musical instruments—pianos, organs, melodeons, instruments used in bands and concerts.

Sixth Group.—Specimens of printing and bookbinding, stationery, globes, maps, charts, and all apparatus for instructing in science, tables and machines for calculation.

Seventh Group.—Philosophical instruments, mathematical and measuring instruments, dials, chronometers, watches and clocks, telescopes, microscopes, lenses, cameras and other optical instruments, excepting those to be carried in the pocket.

### FIRST GROUP.

*Judges*—Messrs. Louis Lang and Vincent Colyer.

H. Wood, Jr., 639 Broadway, for an oil painting, landscape, Bierstadt, artist. First medal and a diploma.

Mrs. Wm. H. Hicks, Stamford, Conn., for an oil painting, "View on the Housatonic river," C. W. Griswold, artist. Second medal and a diploma.

Oliver J. Lay, 534 Second avenue, for an oil painting, "The Herb Doctor." Second medal and a diploma.

T. C. Ruckle, 37 Park Row, for an oil painting, "Ordination of Bishop Asbury." Third medal and a certificate.

Fritz Meyer, 59 Fulton street, for a water color painting, "Tomb of Baron Von Humboldt." Second medal and a diploma.

Mrs. Soper, 112 Essex street, for an oil painting, game piece. Third medal and a certificate.

William T. Matthews, for an oil painting, fruit and flower piece. First medal and a diploma.

E. G. Durant, 83 Beekman street, for an oil painting. Second medal and a diploma

A. E. Walker, 483½ Third avenue, for a burnt wood etching. Third medal and a certificate.

*Judges.*—Messrs. CHRISTIAN D. COUENHOVAN, GEORGE W. FORDHAM and PETER LODEWICK.

Otto Steitz, 76 William street, for glass letters. Third medal and a certificate.

Francis B. Asbury, 167 William street, for gilding on glass. Third medal and a certificate.

Thomas G. Hojer, 281 Third avenue, for gilding on glass. Third medal and a certificate.

Strong & Son, 86 Walker street, for sign painting. Third medal and a certificate.

### SECOND GROUP.

*Judges*—Messrs. LOUIS LANG and VINCENT COLYER.

L. Prang & Co., Boston, Mass., for chromo-lithographs. First medal and a diploma.

H. Wood, Jr., 639 Broadway, for American chromos. Second medal and a diploma.

### THIRD GROUP.

*Judges*—Messrs. D. HUNTINGTON, H. C. SHUMWAY, JOHN M. MASTERTON, A. WETMORE, Jr. and EDWARD L. WILSON.

Huston & Kurtz, 895 and 897 Broadway, for porcelain pictures and carbon prints. First medal and a diploma.

Wenderoth, Taylor & Brown, Philadelphia, Pa., for porcelain pictures and carbon prints. Second medal and a diploma.

Joseph M. Herron, 46 East Fourteenth street, for plain porcelain photographs. Second medal and a diploma.

C. H. Williamson, 245 Fulton street, Brooklyn, L. I., for colored photographs on paper. Third medal and a certificate.

George G. Rockwood, 839 Broadway, for large photographic views and life-sized photographic portraits. First medal and a diploma.

J. Gurney & Son, 707 Broadway, for plain photograghs (cartes imperiale). First medal and a diploma.

Notman & Co., Boston, Mass., for plain photographs (cartes imperiale). Second medal and a diploma.

H. J. Newton, Forty-seventh street, for prints from paper negatives. First medal and a diploma.

Follett & Johnston, 232 West Twenty-sixth street, for photographic alabaster paper. First medal and a diploma.

### FOURTH GROUP.

*Judges*—Messrs. JOHN B. RICH, CHARLES P. DALY, and JAMES WARD.

Haas & Robertson, 272 Fourth avenue, for collection of electrotypes. First medal and a diploma.

E. Plassman, 93 Sixth avenue, for two frames of wood carving. First medal and a diploma.

United States Machine Carving Company, Second avenue corner Twenty-second street, for carving by machinery in wood and stone. First medal and a diploma.

H. Mueller, 79 Third avenue, for a collection of wood carving. Second medal and a diploma.

Frederick Sebald, 9 Baxter street, for carving in pearl, ornamentation of photographic albums. Third medal and a certificate.

Jules Lebrethon, 643 Broadway, for carved lava, imitation of cameos, and precious stones. Third medal and a certificate.

E. Plassman, 93 Sixth avenue, for very fine artistic modeling in plaster—birds and leaves. Third medal and a certificate.

George P. Putnam & Son (exhibitors), 661 Broadway, for specimens of photo sculpture. Third medal and a certificate.

George G. Rockwood, 839 Broadway, for photo-medallions. Third medal and a certificate.

### FIFTH GROUP.

*Judges*—Messrs. Henry J. Newton, George A. Bristow, Edward Mollenhauer, Charles Fradel, A. D. W. Besemann, Frederick Brandies and M. J. Giannetti.

Barlow & Doehler (exhibitors), 694 Broadway, for Mathusek's concert grand piano forte. Second medal and a certificate.

Barlow & Doehler (exhibitors), 694 Broadway, for Mathusek's colibri piano forte. Second medal and a diploma.

Manner & Co., 187 and 189 Bowery, for the Arion piano forte. Second medal and a diploma.

Ouvrier & Sons, 33 West Thirteenth street, for an upright piano forte. Second medal and a diploma.

Derrick, Filgemaker & Co., Buffalo, N. Y., for pipe organs. First medal and a diploma.

J. Este & Co., Brattleboro, Vt., Saxe & Robertson, agents, 417 Broome street, for a large Reed organ. Second medal and a diploma.

Schrieber Cornet Manufacturing Co., 99 East Houston street, for a collection of musical wind instruments, of brass and German silver. First medal and a diploma.

J. Bauer & Co., 650 Broadway, for a collection of musical instruments. Second medal and a diploma.

J. W. Tanner, 191 Lewis street, for German silver fifes. Third medal and a certificate.

Charles Van Oeckelen, 2 Depau row, for a banjo with long lever, Third medal and a certificate.

F. Glaentzer, 551 Eighth avenue, for a banjo. Third medal and a certificate.

### SIXTH GROUP.

*Judges*—Messrs. John B. Rich, Chas. P. Daly and James Ward.

G. P. Putnam & Son, 661 Broadway, for specimens of printing and binding First medal and a diploma.

J. E. Tilton & Co., Boston, Mass., for specimens .of printing and binding. Third medal and a certificate.

Jacob Hyatt, 12 John street, for frame of card engraving. Third medal and a certificate.

Otis F. Bedell, 131 William street, for a slate washer and desk sponge. Third medal and a certificate.

Haskins & Cammeyer, 36 Beekman street, for patent document envelopes. Third medal and a certificate.

### SEVENTH GROUP.

*Judges*—Messrs. G. W. HOUGH and JOHN E. GAVIT.

G. M. Stevens & Co., Boston, Mass., for a tower clock. Third medal and a certificate.

George A. Jones & Co., 5 Cortlandt street, for a watchman's clock. Third medal and a certificate.

D. G. Hodgkins, Williamsburgh, L. I., for an eight-day regulator. Third medal and a certificate.

A. Frankfield & Co., 209 Sixth avenue, for cuckoo clocks. Third medal and a certificate.

J. S. Birch, 8 John street, for watch pendants. Third medal and a certificate.

C. E. Lombard, for an improved watch key, Benedict Brothers, agents, 171 Broadway. Third medal and a certificate.

G. A. Jones & Co., 6 Cortlandt street, for a regulator. Second medal and a diploma.

Blunt & Nichols, 179 Water street, for a chronometer watch. First medal and a diploma.

American Watch Company, for a hunting watch, exhibited by Benedict Brothers, 171 Broadway. Second medal and a diploma.

National Watch Company, Elgin, Ill., for watch movements, exhibited by Benedict Brothers, 171 Broadway. Third medal and a certificate.

D. W. S. Rawson, Peru, Ill., for a stereoptican. Third medal and a certificate.

American Optical Company, Fifty-third street, for globe lens for landscape and copying. First medal and a diploma.

Willard Manufacturing Company, 684 Broadway, for camera tubes and lenses for portraits. First medal and a diploma.

F. Wolfe, Philadelphia, Pa., for a model vignetting apparatus. Third medal and a certificate.

William H. Paine, Green Point, L. I., for a steel measuring tape for surveyors. First medal and a diploma.

Edw. Busch, 62 Chatham street, for thermometers. Third medal and a certificate.

Blunt & Nichols, 179 Water street, for nautical and surveying instruments. Second medal and a diploma.

G. Tagliabue, 298 Pearl street, for hydrometers and thermometers. Second medal and a diploma.

L. Colomba, 53 Rose street, for philosophical instruments. Third medal and a certificate.

*Judges*—Messrs. JOHN E. GAVIT, JACOB CAMPBELL, SAMUEL JACKSON and JOHN FREY.

William Wales, New York, for a set of microscopic objectives. First medal and a diploma.

Wiliam Wales, New York, for a mechanical finger. Second medal and a diploma.

William Wales, New York, for a microscopic object illuminator. Second medal and a diploma.

## II.—DEPARTMENT OF THE DWELLING.

*Under the supervision of Messrs.* CHARLES K. HAWKES, R. G. HATFIELD *and* ISAAC WALTON.

FIRST GROUP.—Apparatus for warming, lighting, cooling and ventilating; cooking stoves, ranges and refrigerators

SECOND GROUP.—Kitchen ware and utensils; machines and implements for washing and preparing clothes.

THIRD GROUP.—Carpets, oil cloths, matting, paper hangings and tapestry.

FOURTH GROUP.—Cabinet furniture—mirrors, upholstery and room conveniences; writing desks, ornamental safes.

FIFTH GROUP.—Table furniture—cutlery, castors, glass, porcelain, silver, and other ware used for holding food and condiments.

SIXTH GROUP.—Ornaments for the dwelling house, excepting those embraced in the first department; billiard tables, chessmen and boards; contrivances for in-door recreation and amusement.

SEVENTH GROUP.—Building accessories and permanent attachments; doors, window sash, blinds, mantels, grates, stairs, encaustic tiles and other specimens of flooring, timber frames, cut and cast ornaments for the outside of dwellings, plumbers' work, water closet apparatus and baths, bells, door springs, locks, latches, bolts, hinges, screws, nails, and other household hardware, useful and ornamental articles for the grounds surrounding the dwelling.

### FIRST GROUP.

*Judges*—Messrs. D. I. STAGG and D. SAUNDERS.

Pratt & Wentworth, North street, Boston, Robert Z. Liddle, agent, 250 Water street, for the "Peerless" cooking stove. First medal and a diploma.

J. E. Liddle, 250 Water street, for the "Peerless" fire place heater. Second medal and a diploma.

Moneuse & Duparquet, 28 and 30 Green street, for a range for hotels. Second medal and a diploma.

Lazear & Sharp, 128 Sixth avenue, for dome gas stoves. Second medal and a diploma.

Thatcher & Haviland, 602 Broadway, for portable heaters. Third medal and a certificate.

Hull & Grippen, 288 Third avenue, for an hot air range. Third medal and a certificate.

*Judges*—Messrs. THOMAS D. STETSON, JAMES B. OGDEN and IRA L. CADY.

Tucker Manufacturing Company, Boston, Mass., for bronzed chandeliers. First medal and a diploma.

J. P. Frink, 551 Pearl street, for reflectors. Second medal and a diploma.

A. M. Lesley, 605 Sixth avenue, for refrigerators. Second medal and a diploma.

A. S. Lyman, 212 Second avenue, for an air purifier. Second medal and a diploma.

Julius Ives & Co., 49 Maiden lane, for lamps, chandeliers, &c. Second medal and a diploma.

C. F. A. Hinrichs, 150 Broadway, for lamps. Third medal and a certificate.

B. J. Burnett, Mount Vernon, N. Y., for ventilators. Third medal and a certificate.

J. H. Kramer, 180 Grand street, for lanterns. Third medal and a certificate.

F. W. Willard, 392 Bleecker street, for a patent taper-burner lamp. Second medal and a diploma.

H. Danforth, New York, for atmospheric lamps to burn kerosene oil. Third medal and a certificate.

### SECOND GROUP.

*Judges*—Messrs. Wm. H. Crossman, George W. Van Tine and Henry A. Patterson.

H. F. Forbush & Co., 675 Broadway, for a bread-mixing and kneading machine. Second medal and a diploma.

David H. Goodell, Pontaic, N. H., Sargent & Co., agents, 70 Beekman street, for the lightning apple parer. Second medal and a diploma.

P. Miles, 436 Greenwich street, for meat cutters. Second medal and a diploma.

E. Richmond, 146 Mercer street, for racks for brooms, brushes, &c. Third medal and a certificate.

Steele & Co., 3 Park Row, for feather dusters. Second medal and a diploma.

Excelsior Manufacturing Company, New Haven, Conn., for the "Eureka" coffee pot. Second medal and a diploma.

E. H. Sargent, Boonton, N. J., for alarm coffee pot. Third medal and a certificate.

Mrs. H. H. Cole, 601 Broadway, for a fluting machine. Third medal and a certificate.

F. M. Evans & Co., 55 Beekman street, for carpet stretcher and tacker. Second medal and a diploma.

American Papier Maché Manufacturing Company, Green Point, L. I., for papier maché pails, bowls, &c. Third medal and a certificate.

New York Stone Ware Company, 358 Pearl street, for earthen ware. Third medal and a certificate.

John Burgam, Concord, N. H., for a device for keeping meats under brine. Third medal and a certificate.

*Judges*—Messrs. Wm. W. Sanger, Henry T. Blodget, Richard Chinery, and Robt. B. Coleman.

H. E. Smith, 18 Dey street, for hydraulic hand washing machine. Second medal and a diploma.

C. H. Hale, Fayetteville, Onondaga Co., N. Y., for adjustable washing machine. Third medal and a certificate.

N. B. Phelps, 17 Courtlandt street, for screw pressure wringers. Second medal and a diploma.

R. C. Browning, 32 Courtlandt street, for screw pressure wringers. Third medal and a certificate.

G. Moulton, Boston, Mass., for self adjusting "Eureka" wringer. Third medal and a certificate.

### THIRD GROUP.

*Judges*—Messrs. Theodore F. Breese and M. Y. Cady.

R. & H. Hutchinson, 397 North Second street Williamsburgh, L. I., for coir matting and mats. Second medal and a diploma.

Barton, Terhune & Brett, 141 Fulton street, for window shades. Third medal and a certificate.

### FOURTH GROUP.

*Judges*—Messrs. Gustavus Reid, Frederick Evers and J. W. Van De Water.

Charles C. Schmidt, 426 Sixth avenue, for folding chairs. Second medal and a diploma.

Fisher & Bros., 126 McDougal street, for a table and cabinet. Second medal and a diploma.

Tucker Manufacturing Company, Boston, Mass., for bronzed bedsteads. Second medal and a diploma.

Alexander Roux, 827 Broadway, for a cabinet. Second medal and a diploma.

A. Tower, 15 Laight street, for spring bed bottoms. Second medal and a diploma.

J. F. C. Pickhardt, 167 Bleecker street, for secretary, bed, &c. Second medal and a diploma.

Bylandt & Waldron, 646 Broadway, for a lady's escritoire. Third medal and a certificate.

Ethan Whitney, Milford, Mass., and 217 Canal street, New York, for a spring bed. Third medal and a certificate.

Henry Holton Vere, 342 Sixth avenue, for Elysian bed. Third medal and a certificate.

H. Suckow, 68 West Thirteenth street, for patent extension table. Third medal and a certificate.

J. R. Bennett, 317 East Thirty-fourth street, for combination bed, table, &c. Third medal and a certificate.

W. T. Whitmore, 56 Murray street, for mosquito bars. Third medal and a certificate.

Schwalbe & Buehler, 136 East Twenty-eighth street, for divan and bed. Third medal and a diploma.

### FIFTH GROUP.

*Judges*—Messrs. HENRY WINN, THOMAS E. GAYNOR and W. H. CROSSMAN.

Reed & Barton, Taunton, Mass., E. D. Bassford, agent, 1 Cooper Union, for plated ware. Second medal and a diploma.

Rogers, Smith & Co., George H. Kitchen & Co., agents, 591 Broadway, for plated ware. Third medal and a diploma.

George H. Kitchen & Co., 591 Broadway, for engraved glass. Second medal and a diploma.

William L. Quinnell, 6 Howard street, for cut glass. First medal and a diploma

D. E. Smith & Co., Bronxville, N. Y., for pocket cutlery. Second medal and a diploma.

E. Knabechuck, 121 Green street, for turned articles of wood. Second medal and a diploma.

American Enamel Company, Providence, R. I., W. C. Peckham, agent, for enameled goods. Third medal and a certificate.

S. Lee, Taunton, Mass., W. Pomeroy & Co., 553 Broadway, for patent steels. Third medal and a certificate.

C. Arthur Totten, 195 Broadway, for American filtering cups and goblets. Third medal and a certificate.

### SIXTH GROUP.

*Judges*—Messrs. GEORGE H. SARGENT and WALTER HAWKES.

Tucker Manufacturing Company, Boston, Mass., for bronze clock cases. First medal and a diploma.

Phelan & Collender, 63 Crosby street, for a billiard and dining table combined. Third medal and a certificate.

United States Machine Carving Company, corner Second avenue and Twenty-second street, for wood carving by machinery. Second medal and a diploma.

P. Mignot, 7 Wooster street, for bronze mountings. Third medal and a certificate.

Scovill Manufacturing Company, 37 Park row, for union and velvet frames. Third medal and a certificate.

S. J. Pardessus & Co., 89 Liberty street, for glass shades. Third medal and a certificate.

Osborn Manufacturing Company, 109 Bleecker street, for bird cages. Third medal and a certificate.

John Haggerty, Jersey City, N. J., for ornamental parlor fountain. Third medal and a certificate.

E. Richmond, 146 Mercer street, for billiard cue rack. Third medal and a certificate.

B. Underwood, 120 Nassau street, for walnut brackets. Third medal and a certificate.

### SEVENTH GROUP.

*Judges*—Messrs. G. B. GERMOND, WILLIAM SHUTE and G. VAN NOSTRAND.

D. B. Hedden, Newark, N. J., for patent step ladder. Third medal and a certificate.

American Fire Escape and Fireman's Ladder Co., 29 Cedar street, for a fire escape. Second medal and a diploma.

T. B. Stewart, 605 Sixth avenue, for marbleized slate mantels. Second medal and a diploma.

Wm. H. Jackson, 891 Broadway, for grates and fenders. Second medal and a diploma.

John McLaughlin, 152 Atlantic street, Brooklyn, for an improvement on hot air registers. Third medal and a certificate.

*Judges*—Messrs. C. F. CHANDLER, JAMES INGRAM, and W. K. THOMAS.

Colwell, Shaw & Willard Manuf. Co., foot of West Twenty-seventh street, for tin-lined pipe. First medal and a diploma.

H. H. Cragie, 11 East Twentieth street, for water closet. Third medal and a certificate.

J. K. Mayo, New York, for water pipes. Third medal and a certificate.

H. W. Pond, Newark, N. J., for a portable shower bath. Third medal and a certificate.

J. R. Baker & Co., 179 Pavonia avenue, Jersey City, N. J., for model of blind fixtures. Third medal and a certificate.

*Judges*—Messrs. WM. K. THOMAS and F. G. SPENCER.

Johnson Rotary Lock Co., 18 John street, for rotary locks. Third medal and a certificate.

Webb & Hermann, 394 Broome street, for sealing revenue padlocks. Third medal and a certificate.

C. S. Osborn & Co., Newark, N. J., for saddle, trunk, harness and trimmers' tools. Third medal and a certificate.

C. H. Stockbridge, Northampton, Mass., for adjustable braces. Second medal and a diploma.

Union Bit-Brace Co., Northampton, Mass., for adjustable braces (Rose patent). Third medal and a certificate.

International Screw Nail Co., Northampton, Mass., for screw nails. First medal and a diploma.

Cromwell & Jones, 181 Water street, for quartz sand-paper. Third medal and a certificate.

Smith & Butler, 449 Broadway, for specimens of electrotyping. Second medal and a diploma.

G. Stackpole, 165 Broadway, for an improved patent bit-brace. Third medal and a certificate.

H. G. Sheppardson & Co., Shelburn Falls, Mass., for double cut bits and gimlets, and amateur tools. Third medal and a certificate.

*Judges*—Messrs. HENRY B. RENWICK and SAMUEL HAMMOND.

Linus Yale, jr., Piermont, N. Y., for bank, safe and small locks. First medal and a diploma.

Joseph Corbett, 21 Dunham's place, Williamsburgh, L. I., for permutation safe locks. Third medal and a certificate.

## III.—DEPARTMENT OF DRESS AND HANDICRAFT.

*Under the supervision of Messrs.* FRANK MOORE *and* J. GROSHON HERRIOT.

FIRST GROUP.—Apparel for ladies—hats, bonnets, dresses, hose, boots and shoes, gloves, shawls, cloaks, mantillas, manufactured furs.

SECOND GROUP.—Apparel for gentlemen—hats, caps, coats, vests, pantaloons, shoes, boots, gloves, overcoats, cloaks, under garments, furs.

THIRD GROUP.—Cloths of wool, cotton and silk; all other fabrics, woven, knit or felt; ribbon, cords, tassels, thread, buttons, pins, and other materials used in combination with cloth for dresses.

FOURTH GROUP.—Hand implements used by ladies in manufacturing dress—sewing machines, knitting machines, needles, thimbles, scissors, &c.

FIFTH GROUP.—Specimens of dentistry, artificial limbs, wigs and hair work, surgical apparatus and surgical instruments, spectacles and opera glasses.

SIXTH GROUP.—Jewelry and ornaments for the person; attachments used in out-door sports—skates, fishing tackle, hunting and shooting apparatus; gymnastic implements, and toys for children.

SEVENTH GROUP.—Trunks, carpet bags, reticules, traveling cases, pocket books, razors, pocket knives, pocket pens, pencils, umbrellas, parasols, and hand implements not elsewhere enumerated.

### FIRST GROUP.

*Judges*—Messrs. STEPHEN HYATT, JAMES L. TODD and ALANSON PRATT.

Duncan MacFarlane, Eighty first street, corner of Broadway, for a silk shawl. Second medal and a diploma.

Mrs. E. Weston, 495 Broadway, for a specimen of work by Grover & Baker's sewing machine. Second medal and a diploma.

Convex Weaving Company, One Hundred and Forty-ninth street, for woven corsets. Third medal and a certificate.

S. O. Brigham, 205 Broadway, for garment conformators. Third medal and a certificate.

Lord & Taylor, Broadway, corner of Grand street, for embroideries, ladies' and children's furnishing goods. Second medal and a diploma.

Miss Jane Gray, Boston, Mass., for amozine embroideries. Second medal and a diploma.

Bruen Manufacturing Company, 687 Broadway, for specimens of embroidery. First medal and a diploma.

James H. Prentice, Brooklyn, L. I., for felt skirts. Second medal and a diploma.

Henry C. Letsinger, 139 Fourth avenue, for ladies' boots and shoes. Second medal and a diploma.

Robert H. Bolden, 131 Wooster street, for heels for boots and shoes Third medal and a certificate.

Biglow & Co., 185 Fulton street, Brooklyn, L. I., for ladies', misses' and children's hats. Third medal and a certificate.

### SECOND GROUP.

*Judges*—Messrs. Stephen Hyatt, James L. Todd and Alanson Pratt.

John L. Watkins, 867 Broadway, for boots and shoes. Second medal and a diploma.

J. N. Brewster, 14 Clymer street, Brooklyn, L. I., for spring sole plates. Second medal and a diploma.

*Judges*—Messrs. James L. Todd, James H. Sackett and Alanson Pratt.

S. W. H. Ward, 387 and 862 Broadway, for shirts, collars and furnishing goods. Third medal and a certificate.

James C. Merritt, 414 West Twenty-ninth street, for scarf holders. Third medal and a certificate.

*Judges*—Messrs. Lewis Mealio, C. Godfrey Gunther and Henry T. Drowne.

Biglow & Co., 185 Fulton street, Brooklyn, L. I., for ladies' furs and gentlemen's goods and silk hats. First medal and a diploma.

### THIRD GROUP.

*Judges*—Messrs. Stephen Hyatt, James L. Todd and Alanson Pratt.

Scovill Manufacturing Company, 4 Beekman street, for gilt and metal plated metal buttons. First medal and a diploma.

Steele & Johnson Button Company, Waterbury, Conn., for gilt and fancy buttons. Third medal and a certificate.

Henry Gerner, 450 Sixth avenue, for self fastening buttons. Third medal and a certificate.

Lippitt Woolen Company, Woonsocket, R. I., for fancy cassimeres. Third medal and a certificate.

Whiteside Brothers, Moodna, N. Y., for manufactured flax. First medal and a diploma.

Cheney Brothers, Hartford, Conn., for silk goods. First medal and a diploma.

Hadley Manufacturing Company, Holyoke, Mass., for spool cotton. First medal and a diploma.

J. H. & G. Holland, Willimantic, Conn., for sewing machine twist. Third medal and a certificate.

John B. Wood, Providence, R. I., for knitting cotton. Third medal and a certificate.

### FOURTH GROUP.

*Judges*—Messrs. William Pratt, Ira L. Cady and L. J. Knowles.

Florence Sewing Machine Company, 505 Broadway, for a sewing machine. First medal and a diploma.

Bruen Manufacturing Company, 687 Broadway, for an improved sewing machine. Third medal and a certificate.

Elliptic Sewing Machine Company, 543 Broadway, for the Elliptic sewing machine. Second medal and a diploma.

Bartram & Fanton Manufacturing Company, Danbury, Conn., for a sewing machine attachment for button holes, attachment for sewing on buttons. First medal and a diploma.

Empire Sewing Machine Company, 616 Broadway, for a sewing machine. Second medal and a diploma.

Stackpole Manufacturing Company, New York, for Stackpole duplex sewing machine. Second medal and a diploma.

J. W. Bartlett, 569 Broadway, for a reversible sewing machine. Third medal and a certificate.

Halligan & Shapter, 48 Chatham street, for a machine for sewing leather. First medal and a diploma.

Miss Jane Gray, Boston, Mass., for an "Orphean" embroidering and fringing machine. Second medal and a diploma.

Sibley & Stoops, corner Broadway and Bleecker street, for a rolling platform for sewing machines. Third medal and a certificate.

Fuller & Barnum, 643 Broadway, for a tuck creaser and self sewer combined. Second medal and a diploma.

J. F. Clemons, Springfield, Mass., for a cloth guide and marker for sewing machines. Second medal and a diploma.

James McCall, 543 Broadway, for a royal chart for cutting dresses. Third medal and a certificate.

Hinkley Knitting Machine Company, Bath, Me., for a family knitting machine. First medal and a diploma.

Bridgeport Knitting Machine Company, Bridgeport, Conn., for knitting machine. First medal and a diploma.

Lamb Knitting Machine Company, Chicopee Falls, Mass., for a knitting machine. First medal and a diploma.

Henry Seymour & Co., 52 Beekman street, for tailors' shears. Third medal and a certificate.

United States Patent Button Machine Company, 110 Leonard street, for a machine and patent buttons. Third medal and a certificate.

### FIFTH GROUP.

*Judges*—Messrs. D. M. DAVIDSON, E. C. RUSHMORE and A. C. HAWES.

S. S. White, 767 Broadway, for artificial teeth. First medal and a diploma.

Johnston & Lund, Philadelphia, for artificial teeth. Second medal and a diploma

John D. Chevalier & Son, 737 Broadway, for dental instruments. First medal and a diploma.

S. S. White, 767 Broadway, for dental instruments. Second medal and a diploma.

J. Allen & Sons, 22 Bond street, for mounted artificial teeth, platinum base. Second medal and a diploma.

*Judges*—Messrs. A. K. GARDNER, J. V. C. SMITH and JOHN J. CRAVEN.

A. A. Marks, 575 Broadway, for artificial limbs. First medal and a diploma.

William T. Fry & Co., 134 and 136 William street, for a breast pump and cupping cups. First medal and a diploma.

S. N. Marsh & Co., 2 Vesey street, for trusses. First medal and a diploma.

J. A. Sherman, 334 East Thirtieth street, for surgical appliances. Second medal and a diploma.

Wm. Pomeroy & Co., 553 Broadway, for trusses. Third medal and a certificate.

Thomas McIlroy, 145 Perry street, for invalid and fracture beds. First medal and a diploma.

Thomas McIlroy, 145 Perry street, for surgical operating tables. Third medal and a certificate.

### SIXTH GROUP.

*Judges*—Messrs. JOHN B. RICH and WILLIAM MARTIN.

Bangs Williams News Company, Providence, R. I., for fancy boxes. First medal and a diploma.

Miss A. De Etta Bloodgood, 55 West Thirty-first street, for wax flowers. Second medal and a diploma.

Mrs. Mary Scheiffele, 402 West Forty-seventh street, for wax flowers. Third medal and a certificate.

Mrs. H. B. Gilbert, Auburn, N. Y., for wax flowers. Third medal and a certificate.

J. J. McCormick, Brooklyn, for skates with steel soles, &c. Third medal and a certificate.

Phineas Smith, 25 Cliff street, for skates. Third medal and a certificate.

James B. Macduff, 101 Norfolk street, for a method of introducing shirt studs, cuffs, buttons and watch guards. Third medal and a certificate.

B. Lee, Jr., Williamsburgh, L. I., for patent fish hooks. Third medal and a certificate.

### SEVENTH GROUP.

*Judges*—Messrs. WILLIAM DEMUTH and A. RATH.

Kaldenberg & Son, 23 Wall street, for meerschaum pipes. First medal and a diploma.

*Judges*—Messrs. E. S. BOYNTON, W. IRVING ADAMS and HENRY T. DROWNE.

Dennin & McNamara, 932 Broadway, for trunks. Second medal and a diploma.

Crouch, Fitzgerald & Brown, 1 Maiden lane, for sole leather trunks. Third medal and a certificate.

Upright Patent Trunk Company, 6 Barclay street, for an upright patent trunk. Third medal and a certificate.

Charles W. Packer, 1224 Brown street, Philadelphia, for an improved hat box. Third medal and a certificate.

J. J. Cowell, Newark, N. J., for a patent trunk hinge. Third medal and a certificate

## IV.—DEPARTMENT OF CHEMISTRY AND MINERALOGY.

*Under the supervision of Messrs.* CHAS. WAGER HULL *and* LEWIS FEUCHTWANGER.

FIRST GROUP.—Soaps, toilet preparations, candles, oils, wax, resins, and other hydro-carbon compounds.

SECOND GROUP.—Acids, alkalies, other chemical bases, salts, artificial fertilizers, soda water and apparatus for making it, mineral waters, wines, beverages and stimulants, excluding so-called patent medicines.

THIRD GROUP.—Leather, skins, peltry, furs, parchment, specimens of taxidermy, catgut, goldbeaters' skins, membrane preparations, tobacco, cigars and snuff.

FOURTH GROUP.—India rubber and gutta percha preparations, artificial stones, crucibles, cements, prepared materials for roofing, and specimens of brick.

FIFTH GROUP.—Paints, dye stuffs, inks; specimens of dyed yarns, tissues, and other colored substances, and specimens of bleaching.

SIXTH GROUP.—Samples of baking and pastry cooking, sugars, confectionery, prepared condiments, sweetmeats, preserved fruit, vegetables and meats, condensed fluids and extracts used in preparing beverages.

SEVENTH GROUP.—Specimens of natural stones used in building, minerals, ores, metals, alloys, apparatus used in chemical works, implements of the laboratory, stills, condensers, heaters, apparatus for making gas, and machines for expediting chemical changes.

### FIRST GROUP.

*Judges*—Messrs. JULIUS G. POHLE, C. ELTON BUCK and JOHN W. MORGAN.

Colgate & Co., 53 and 55 John street, for toilet soaps. Second medal and a diploma.

Van Haagan, McKeone & Co., 30 Barclay street, for toilet soaps. Third medal and a certificate.

L. S. Judd, 189 Front street, for parafine candles. First medal and a certificate.

R. A. Chesebrough, 126 Maiden lane, for lubricating oils. First medal and a diploma.

F. S. Pease, Buffalo, N. Y., for combined and engine oil. First medal and a diploma.

F. S. Pease, Buffalo, N. Y., for sewing machine oil. Second medal and a diploma.

F. S. Pease, Buffalo, N. Y., for mineral illuminating oil. First medal and a diploma.

Julius Pollock, Morrisania, N. Y., for pyroxylic spirit. First medal and a diploma.

W. R. Wyckoff, Ripon, Wis., for "Naiad" water proof oil. First medal and a diploma.

### SECOND GROUP.

*Judges*—Messrs. JULIUS G. POHLE, C. ELTON BUCK and JOHN W. MORGAN.

John Matthews, 437 and 439 First avenue, for apparatus for making soda and mineral waters. First medal and a diploma.

John Matthews, 437 and 439 First avenue, for apparatus for dispensing soda water. First medal and a diploma.

Robert Grant, Novelty Iron Works, New York, for soda water apparatus. First medal and a diploma.

John Matthews, 437 and 439 First avenue, for Somers' tumbler washer. Third medal and a diploma.

Pennsylvania Salt Manufacturing Company, Pittsburgh, Pa., for concentrated alum. Second medal and a diploma.

Pennsylvania Salt Manufacturing Company, Pittsburg, Pa., for bi-carbonate of soda. Second medal and a diploma.

Chas. Pfizer & Co., 17 Beekman street, for chemicals, especially iodide of potassium, gallic acid, permanganate of potassa and borax. First medal and a diploma.

Rosengarten & Son, Philadelphia, Pa., for chemicals, especially the salts of quinine and morphia, bromide of potassium and iodide of mercury. First medal and a diploma.

L. Martin & Co., Philadelphia, for chemicals, especially for purity of acids, iron by hydrogen, nitrate of silver and salts of bismuth. First medal and a diploma.

Powers & Weightman, Philadelphia, for chemicals, especially oxide of zinc, morphine salts and salts of quinine. First medal and a diploma.

M. Kalbfleisch & Sons, Fulton street, corner of Cliff street, for commercial acids. First medal and a diploma.

Mapes Superphosphate and Guano Company, 184 Water street, for improved superphosphates. Second medal and a diploma.

Phœnix Chemical Company, Elizabeth, N. J., for "Phœnix" disinfectant. First medal and a diploma.

Perkins, Stern & Co., 14 and 16 Vesey street, for California hock and claret. Third medal and a certificate.

### THIRD GROUP.

*Judges*—Messrs. HORACE H. DAY, M. S. KERRIGAN and ADOLPH OTT.

Simmons, Rutter & Co., 8 and 10 Ferry street, for morocco and sheep skin First medal and a diploma.

Union Paste and Sizing Company, 40 Dey street, for "Union" paste. Second medal and a diploma.

J. E. Almy, New Bedford, Mass., for glucine cement. Second medal and a diploma.

L. H. Hale, 16 Beekman street, for tobaccoretts. Second medal and a diploma.

H. Clinton Witt, 66 Liberty street, for Harzman's cigarette roller Second medal and a diploma.

### FOURTH GROUP.

*Judges*—Messrs. HORACE H. DAY, M. S. KERRIGAN and ADOLPH OTT.

W. R. Schanck, inventor, for composition roofing. Second medal and a diploma.

W. L. Potter, inventor, for plastic slate roofing. Third medal and a certificate.

Smith & Speth, Aurora, Ill., for bricks for chimneys. First medal and a diploma.

Eagle Slate Company, Tenth avenue and Twelfth street, for slate for roofing. First medal and a diploma.

Bishop's Gutta Percha Company, for gutta percha goods. First medal and a diploma.

### FIFTH GROUP.

*Judges*—Messrs. FRANCIS E. ENGLEHARDT and CHARLES F. CHANDLER.

Thomas H. Spencer, inventor, for "Novelty" blacking. Third medal and a certificate.

J. H. Doughty, 153 Bowery, for a blacking box. Third medal and a certificate.

### SIXTH GROUP.

*Judges*—Messrs. SAMUEL H. MAYNARD, ERNEST GREENFIELD and GEORGE H BEYER.

French Chemical Works, 134 Reade street, for artificial fruit extracts. Second medal and a diploma.

John J. Squire, 286 Greenwich street, for fruit jars. Second medal and a diploma.

C. C. Williams & Co., 145 Maiden lane, for preserved fruits. Second medal and a diploma.

Cape, Culver & Co., 16 and 18 Leonard street, for hams and bacon. Second medal and a diploma.

Taylor & Young, 186 Front street, for "Pioneer" yeast powder. Second medal and a diploma.

Phœnix Mustard Company, corner of White and Centre streets, for "Phœnix" mustard. Second medal and a diploma.

Charles L. Stickney, 230 East Twelfth street, for mustard. Third medal and a certificate.

James Morton, 128 Fulton avenue, Brooklyn, L. I., for biscuit. Second medal and a diploma.

L. H. Boole, One Hundred and Nineteenth street, between Second and Third avenues, for compressed eggs. Third medal and a certificate.

Peter Cooper, 17 Burling slip, for gelatine. Second medal and a diploma.

### SEVENTH GROUP.

*Judges*—Messrs. CHARLES F. CHANDLER, HENRY DUNCAN, THOMAS EGLESTON and ARTHUR MEAD EDWARDS.

P. P. Meyer, 180 Centre street, for spinning for chemical apparatus. First medal and a diploma.

Colwells, Shaw & Willard Manufacturing Company, foot of West Twenty-seventh street, specimen of burning tin and lead, or soldering without solder. First medal and a diploma.

John P. Gruber, 182 Chatham square, for filtering apparatus. First medal and a diploma.

Indelible Lead Pencil Company, Northampton, Mass., for indelible lead pencils Third medal and a diploma.

## V.—DEPARTMENT OF ENGINES AND MACHINERY.

*Under the supervision of Messrs.* WILLIAM H. HICKS, J. WILSON STRATTON and GEORGE FRANCIS DAWSON.

FIRST GROUP.—Stationary engines driven by steam, heated air and other gases, water engines and water wheels, and other prime movers.

SECOND GROUP.—Pumping machinery, steam fire engines, and other engines for moving fluids.

THIRD GROUP.—Machinery for working metals—lathes, planers, screw cutting machinery, drills.

FOURTH GROUP.—Machinery for working in wood—saws, planing machines, boring machines, machines for mortising and tenoning.

FIFTH GROUP.—Machinery for preparing fibres and tissues, and machinery used in the manufacture of cloth.

SIXTH GROUP.—Machinery and tools used in the manufacture of leather, India rubber, porcelain, pottery, bricks, and materials used in the arts not before specified.

SEVENTH GROUP.—Gearing millwork, and elements of machinery for varying speed or power, and all tools used by artisans or in factories not otherwise provided for.

### FIRST GROUP.

*Judges*—Messrs. WILLIAM W. W. WOOD, W. W VANDERBILT and JAMES R. LEVINESS.

Washington Iron Works, Newburgh, N. Y., for Wright's horizontal engine First medal and a diploma.

Hope Iron Works, Providence, R. I., for Babcock, Wilcox & Co.'s engine. Second medal and a diploma.

Root Steam Engine Company, Second avenue corner Twenty-eighth street, for Root's trunk engine. Third medal and a certificate.

Horatio Allen, Novelty Iron Works, New York, for a pendulum screw propeller engine. Second medal and a diploma.

William E. Bird, 163 Bank street, for an oscillating engine. Third medal and a certificate.

Metropolitan Rotary Engine and Pump Company, New York, for Ortlieb's rotary engine. Third medal and a certificate.

Wilcox Caloric Engine Company, Providence, R. I., for Wilcox's caloric engine. Third medal and a certificate.

Gerner Steam Boiler Company, New York, for Gerner's steam boiler. Second medal and a diploma.

Root Engine Company, Second avenue corner Twenty-eighth street, for Root's sectional wrought iron safety boiler. Second medal and a diploma.

Duplex Steam Boiler Manufacturing Company, Long Island city, for Davis' safety superheating boiler. Third medal and a certificate.

Symmes & Hayes, 470 Water street, for a cone boiler. Third medal and a certificate.

L. J. Knowles, Warren, Mass., for Knowles' automatic boiler feeder. First medal and a diploma.

Clark's Patent Steam and Fire Regulator Company, 117 Broadway, for Clark's steam and fire regulator. Second medal and a diploma.

*Judges*—Messrs. ISAAC V. HOLMES, WM. C. SELDEN and CHAS. E. EMERY.

Wilcox Steam Engine Company, Providence, R. I., for Wilcox's portable steam engine and boiler. First medal and a diploma.

### SECOND GROUP.

### *First Division, First Section.*

*Judges*—Messrs. ISAAC V. HOLMES, WILLIAM C. SELDEN and CHAS. E. EMERY

Campbell & Hardick Brothers, 9 Adams street, Brooklyn, L. I., for the Niagara direct acting steamer pump. First medal and a diploma.

Knowles & Sibley, Warren, Mass., for Knowles' direct acting steam pump Second medal and a diploma.

### *Second Section.*

Campbell & Hardick Bros., 9 Adams street, Brooklyn, L. I., for the "Niagara" crank pump. First medal and a diploma.

Woodward Steam Pump Company, 48 Centre street, for the "Woodward" crank pump. Second medal and a diploma.

Chappell Manufacturing Company, 99 Bank street, for a steam valveless pump. First medal and a diploma.

Turbinate Pump Company, 112 Wall street, for Gerick's centrifugal pump. First medal and a diploma.

### *Second Division.*

Knowles & Sibley, 107 Liberty street, for Knowles' steam hydraulic pump. First medal and a diploma.

J. D. West, 40 Courtlandt street, for West's anti-freezing pump. First medal and a diploma.

John P. Gruber, 182 Chatham square, for Gruber's ale and water works. First medal and a diploma.

D. D. Nash, 58 Hoyt street, Brooklyn, L. I., for Nash's drinking fountain. First medal and a diploma.

Campbell & Hardick Bros., 9 Adams street, Brooklyn, L. I., for a steam air pump. Second medal and a diploma.

Frederick Ortlieb, New York city, for the Metropolitan steam and belt pump. Second medal and a diploma.

H. C. Dart & Co., 5½ Pine street, for a rotary steam pump. Second medal and a diploma.

Rumsey & Co., Seneca Falls, N. Y., for hand power and force pumps. Second medal and a diploma.

J. M. Whitfield & Son, 262 Water street, for a four pull ale pump. Second medal and a diploma.

### THIRD GROUP.

*Judges*—Messrs. William Pratt, William C. Selden and J. Clement.

Pratt, Whitney & Co., Hartford, Conn., for an engine lathe (taper attachment). Second medal and a diploma.

Chelsea Machine Works, Norwich, Conn., for a small engine lathe. First medal and a diploma.

Hall, Washburn & Co., New York, for an engine lathe (cross feed). Third medal and a certificate.

H. D. Stover, 117 Liberty street, for an engine lathe. Third medal and a certificate.

Adam Stewart, 211 Centre street, for a foot lathe (slide rest and eccentric check). Third medal and a certificate.

New York Steam Engine Company; 222 Pearl street, for a bolt and screw cutting machine. Second medal and a diploma.

H. D. Stover, 117 Liberty street, for a large planer. Second medal and a diploma.

New York Steam Engine Company, 222 Pearl street, for a crank planer. Third medal and a certificate.

New York Steam Engine Company, 222 Pearl street, for a large shaping machine. Second medal and a diploma.

H. D. Stover, 117 Liberty street, for a small shaping machine. Second medal and a diploma.

New York Steam Engine Company, 222 Pearl street, for a drill press, swing table. Second medal and a diploma.

New York Steam Engine Company, 222 Pearl street, for a car wheel drill press. Second medal and a diploma.

New York Steam Engine Company, 222 Pearl street, for a horizontal drilling and boring machine. Second medal and a diploma.

V. F. Douglass, Stamford, Conn., for a friction self-fed hand drill. Third medal and a certificate.

Hall, Washburn & Co., New York, for a hand drill press. Third medal and a certificate.

Golding, Cheeny & Co., Providence, R. I., for a drop hammer. Second medal and a diploma.

N. C. Stiles, West Meriden, Conn., for a drop hammer. Second medal and a diploma.

T. Prosser & Son, 15 Gold street, for a compressed air forging hammer. Second medal and a diploma.

Charles Merrill & Sons, 556 Grand street, for an air spring forging hammer Second medal and a diploma.

Richard Dudgeon, 24 Columbia street, for a steam forging hammer. Second medal and a diploma.

N. C. Stiles, West Meriden, Conn., for power punching presses. Second medal and a diploma.

E. Brown, 340 Delancy street, for power punching and drawing presses. Second medal and a diploma.

N. C. Stiles, West Meriden, Conn., for a foot punching press. Second medal and a diploma.

E. Brown, 340 Delancy street, for a foot punching press. Third medal and a certificate.

C. Graham, Kingston, Pa., for an hydraulic spring tester. Second medal and a diploma.

James Patterson, Williamsburgh, N. Y., for a blacksmith's forge and tuyere. First medal and a diploma.

Cooper & Philips, Providence, R. I., for a planing, lathe and threading tool holder. Second medal and a diploma.

T. L. Webster, Navy Yard, Brooklyn, L. I., for jointed holders for planing and slotting. Second medal and a diploma.

Webster & Co., 17 Dey street, for tools for cutting off and threading pipe. Second medal and a diploma.

G. W. Harris, 357 Ninth avenue, for lathe chuck for drills, &c. Second medal and a diploma.

C. F. Hall & Son, 95 Liberty street, for valve refitting machine. Second medal and a diploma.

Hall & Gifford, 187 Bowery, for compound lever cut nippers. Second medal and a diploma.

T. Prosser & Son, 15 Gold street, for boiler maker's tools. Second medal and a diploma.

F. C. Entwistle, 2 Liberty street, for Entwistle's mode of transmitting motion Third medal and a certificate.

### FOURTH GROUP.

*Judges*—Messrs. J. Q. Brown, Geo. W. Tharfe and Andrew R. Arnold.

Charles Murdock, Ellenville, N. Y., for an automatic stave machine. First medal and a certificate.

Huntington Machine Company, 121 Halsey street, Newark, N. J., for a spoke lathe. Third medal and a certificate.

J. A. Fay & Co., Cincinnati, Ohio, for a surface planer (car work). Second medal and a diploma.

G. V. Orton, Cincinnati, Ohio, for a machine for wiring blinds. Third medal and a certificate.

Seymour & Whitlock, Newark, N. J., for a machine for wiring blinds. Third medal and a certificate.

G. J. Rugg, Worcester, Mass., for a planing, tongueing and grooving machine. Second medal and a diploma.

Seymour & Whitlock, Newark, N. J., for a last turning machine. Third medal and a certificate.

H. D. Barnes, New Haven, Conn., for a shingle machine. Third medal and a diploma.

C. B. Rogers & Co., Norwich, Conn., for planer, matcher and double surface planer combined. Second medal and a diploma.

C. B. Rogers & Co., Norwich, Conn., for a resawing machine. Second medal and a diploma.

First & Pryibil, 175 and 177 Hester street, for a band sawing machine. Second medal and a diploma.

Seymour & Whitlock, Newark, N. J., for a circular saw. Third medal and a certificate.

Baxter D. Whitney, Winchendon, Mass., for a stave saw machine. Second medal and a diploma.

L. Wright, Newark, N. J., for a circular saw and moulding machine combined Second medal and a diploma.

J. A. Fay & Co., Cincinnati, Ohio, for a scroll saw (light). Second medal and a diploma.

L. Wright, Newark, N.J., for a scroll saw (heavy). Second medal and a diploma.

Valentine H. Quinby, for Ryder's foot scroll saw, with new treadle motion. Third medal and a certificate.

P. Kenney, 74 Ann street, for circular saw arbors. Third medal and a certificate

W. H. Doane, Cincinnati, Ohio, for a mortise machine. Third medal and a certificate.

J. A. Fay & Co., Cincinnati, Ohio., for a mortise machine (car work). Second medal and a diploma.

C. B. Rogers & Co., Norwich, Conn., for a mortise machine (general work). Second medal and a diploma.

Seymour & Whitlock, Newark, N. J., for a stile boring machine. Third medal and a certificate.

Seymour & Whitlock, Newark, N. J., for a mitre cutting machine. Third medal and a certificate.

L. Wright, Newark N. J., for cross-cut traverse saw. Third medal and a certificate.

C. B. Rogers & Co., Norwich, Conn., for a sash machine. Second medal and a diploma.

J. A. Fay & Co., Cincinnati, Ohio, for a moulding machine. Third medal and a certificate.

Huntington Machine Company, Newark, N. J., for a moulding machine (four side). Second medal and a diploma.

Baxter D. Whitney, Winchendon, Mass., for a smoothing machine. First medal and a diploma.

Baxter D. Whitney, Winchendon, Mass., for a cylinder surface planer. First medal and a diploma.

Asahel Davis, Lowell, Mass., for a surface planer. Third medal and a certificate.

C. B. Rogers & Co., Norwich, Conn., for a three-side moulding machine. Second medal and a diploma.

J. Richards, Cincinnati, Ohio, for a lathe. Third medal and a certificate.

G. V. Orton, Cincinnati, Ohio, for a machine for rounding ends of sash. Second medal and a diploma.

### FIFTH GROUP.

*Judges*—Messrs. WM. PRATT, W. B. COGSWELL and GEO. W. THARPE.

Fales, Jenks & Son, Central Falls, R. I., for a spinning frame. Second medal and a diploma.

George Wellman, Lowell, Mass., for automatic self-stripping cards. Second medal and a diploma.

Gambril & Burgess, Baltimore, Md., for a self-stripping cotton cards Third medal and a certificate.

Whiteside Bros., Moodna, N. Y., for a linen loom. Second medal and a diploma.

L. J. Knowles & Bro., Warren, Mass., for a woolen loom (three shuttles). First medal and a diploma.

L. J. Knowles & Bro., Warren, Mass., for a webbing and tape loom. First medal and a diploma.

S. R. Parkhurst, Newark, N. J., for a cotton gin, self-feeding and sliver attachment. Second medal and a diploma.

Richard Kitson, Lowell, Mass., for a two-beater cotton picker. Second medal and a diploma.

C. L. Goddard, 3 Bowling Green, for a wool picker and burrer (Meztizo wool) Second medal and a diploma.

S. R. Parkhurst, Newark, N. J., for a wool picker, burrer and sliver. Third medal and a certificate.

C. L. Goddard, 3 Bowling Green, for burrer rolls (single and double). Second medal and a diploma.

S. R. Parkhurst, Newark, N. J., for a double burrer rolls (and single). Third medal and a certificate.

Sargent Card Clothing Company, Worcester, Mass., for a card machine. First medal and a certificate.

Sargent Card Clothing Company, Worcester, Mass., for card clothing. Second medal and a diploma.

Brown & Ashworth, Lowell, Mass., for a wire heddle machine. First medal and a diploma.

Isaiah Nutt, Jersey City, N. J., for a hat manufacturing lathe. Third medal and a certificate.

L. & P. K. Dederick, Albany, N. Y., for a toggle link press. Second medal and a diploma.

Hadley Company, Hadley, Mass., for a single spooler. Second medal and a diploma.

Bernstein Bros., 479 Broadway, for a chenille machine (for principle). Second medal and a diploma.

Henry Kayser, Twenty-second street and Second avenue, for five loom temples. Second medal and a diploma.

T. Crosley, Bridgeport, Conn., for a carpet printing machine. First medal and a diploma.

### SIXTH GROUP.

*Judges*—Messrs. William Pratt, Lewis Guillaudeu and J. Clement.

J. W. Crossley, 334 Broadway, for a tobacco cutter. Second medal and a diploma.

J. H. Brown, Watertown, Mass., for a hand pegging machine. Second medal and a diploma.

B. Kreischer, 58 Goerck street, for fire brick. Second medal and a diploma.

D. W. Seeley, Albany, N. Y., for the American brick machine. Second medal and a diploma.

Fitzhugh Smith, 56 Cortland street, for samples of India rubber packing. Third medal and a certificate.

### SEVENTH GROUP.

*Judges*—Messrs. HENRY J. DAVISON and GEORGE W. THARFE.

American Steam Gauge Company, Boston, Mass., for a steam engine indicator Third medal and a certificate.

Charles Brombacher, 77 Ann street, for a paper cutter. Third medal and a certificate.

John Bayliss, Fifty-fourth street corner Lexington avenue, for a hot blast and water tuyere iron. Second medal and a diploma.

George W. Bright, Philadelphia, Pa., for a fan blower for forges. Third medal and a certificate.

Charles J. Haucks, Brooklyn, L. I., for patent oil fillers and machine oilers. Third medal and a certificate.

Isidore Dreyfus, 33 Nassau street, for automatic lubricators. Third medal and a certificate.

P. P. Meyer, 180 Centre street, for metal spinning and samples. Third medal and a certificate.

Collins & Co., Hartford, Conn., for wrenches. Third medal and a certificate.

American Ship Windlass Company, Providence, R. I., for a steam winch. Third medal and a certificate.

Edwin Parker, Schenectady, N. Y., for a steam slide balance. Third medal and a certificate.

J. S. Hoar, West Acton, Mass., for bench vises and screw wrenches. Third medal and a certificate.

David Shive, Philadelphia, Pa., for a steam governor. Third medal and a certificate.

Douglass Manufacturing Company, 70 Beekman street, for mechanics' tools Second medal and a diploma.

John Burgum, Concord, N. H., for improved try squares. Second medal and a diploma.

Van Anden File Company, 25 Cliff street, for files and rasps. Third medal and a certificate.

Columbian Metal Works, 74 John street, for brass and copper tubes. Third medal and a certificate.

N. Dunn, One Hundred and Twelfth street corner Third avenue, for drill pumps used in blasting. Third medal and a certificate.

Jones & Laughlin, Pittsburg, Pa., for cold rolled shafting. Second medal and a diploma.

Heim & Zimmerman, 27 Ferry street, for leather belting. Third medal and a certificate.

John Broughton, Brooklyn, L. I., for lubricating gauges, oil cups, &c. Third medal and a certificate.

William Gee, Elm street corner Franklin street, for lubricators and oil cups. Third medal and a certificate.

Samuel Hall's Sons & Co., 229 West Tenth street, for bolts, nuts, &c. Third medal and a certificate.

G. W. Bishop, Stamford, Conn., for a friction clutch pully. Third medal and a certificate.

Howe & Murdock, Woodstock, R. I., for a herculean power lifting machine Third medal and a certificate.

J. R. Harrington, Brooklyn, L. I., for a tuyere iron. Third medal and a certificate.

J. J. Doyle, 650 East Twelfth street, for compound eccentric power tackle. Third medal and a certificate.

A. P. Brown, 57 Lewis street, for steam engine governors. Second medal and a diploma.

Milo Peck, New Haven, Conn., for a low water detector. Third medal and a certificate.

H. G. Ludlow, Troy, N. Y., for a sliding stop-valve. Third medal and a certificate.

Anson P. Stevens, Brooklyn, L. I., for a parallel vise. Third medal and a certificate.

John Richardson, 5 Park Place, for a hair brushing machine. Third medal and a certificate.

Wm. H. Doane, Cincinnati, Ohio, for a patent compression shaft-coupling. Second medal and a diploma.

Wm. H. Doane, Cincinnati, Ohio, for a patent coupling, hangers and shafting. Third medal and a certificate.

J. E. Emerson, Trenton, N. J., for anvil shears and punching machine. Third medal and a certificate.

Peake & Guillandieu, 134 Mercer street, for self-adjusting pipe wrenches. Second medal and a diploma.

T. C. Banks, Wallingford, Conn., for an universal boiler alarm gauge. Second medal and a diploma.

N. Bangs Williams, Providence, R. I., for lubricating cups. Second medal and a diploma.

Socrates Scholfield, for a water-wheel governor. Third medal and a certificate.

## VI.—DEPARTMENT OF INTERCOMMUNICATION.

*Under the supervision of Messrs.* Orestes Cleveland, Lewis Feuchtwanger *and* Nathan C. Ely.

First Group.—Locomotive engines, cars, and all apparatus used in constructing and operating railways, models of bridges, etc.

Second Group.—Carriages, wagons, sleighs, and all vehicles drawn by animal power; harness, saddles, bridles, and all apparatus used in connection with the horse and the stable; and all improvements connected with common roads.

Third Group.—Models of vessels for navigating the ocean, rivers, lakes and canals; all apparatus connected with building, propelling and steering vessels; models of locks, docks, aqueducts; structures and implements used in navigation.

Fourth Group.—Electric telegraphs; apparatus used in constructing telegraph lines; implements and contrivances used in transporting and distributing mails; package express and implements connected therewith; all apparatus for giving signals and alarms, bells, etc.

Fifth Group —Machinery, implements and materials used in printing and engraving.

Sixth Group.—Implements for expediting trade, contrivances used in the store and warehouse; scales, safes, hoisting apparatus, shutters, vault lights, reflectors, and iron columns.

Seventh Group.—Army apparatus used in movements or in camp; guns, pistols, swords; plans for permanent fortifications; all attachments, articles and devices for schools, churches, and public works not elsewhere designated.

### FIRST GROUP.

*Judges.*—Messrs. THOMAS EGLESTON, JR., HAMILTON E. TOWLE and WARREN ROWELL.

Joseph Page Woodbury, Boston, Mass., for a working model of locomotive street cars. First medal and a diploma.

Bridges & Lane, 46 Courtlandt street, for jack screws. First medal and a diploma.

T. W. H. Moseley, Boston, Mass., for a model of a bridge. First medal and a diploma.

Joseph Dixon, 119 Broadway, for cast iron plates for underground railways. First medal and a diploma.

Alfred E. Beach, 37 Park row, for the exhibition of a working section of a pneumatic railway. First medal and a diploma.

### SECOND GROUP.

*Judges*—Messrs. E. RICHMOND, W. P. TROWBRIDGE and J. K. FISHER.

James Eustace, 7 Astor place, for specimens of fancy leather goods. First medal and a diploma.

J. Palmer & Co., Concord, N. H., for improved carriage springs. First medal and a diploma.

John R. Addin, Lynn, Mass., for elastic carriage and car wheels. First medal and a diploma.

J. Bryant, 83 Sand street, Brooklyn, L. I., for a safety bridle. Third medal and a certificate.

George P. Overin & Co., 8 East Houston street, for whips and lashes. First medal and a diploma.

C. Ducreux, 93 Elizabeth street, for an arrangement for detaching runaway horses. First medal and a diploma.

F. B. Doughty, 424 Broadway, for interfering hoof cushions. Second medal and a diploma.

Eugene Ward, 296 Broadway, for a runner for shoeing express wagons. Second medal and a diploma.

John Barclay, Attleboro', Mass., for improved carriage knob. Third medal and a certificate.

C. Williams, 95 Liberty street, for a method of constructing wooden pavements. Second medal and a diploma.

### THIRD GROUP.

*Judges*—Messrs. H. B. WILLSON and W. W. VANDERBILT.

John Golding, 129 Avenue D, for a life preserving mattrass. First medal and a diploma.

Spaulding & Coffin, Boston, Mass., for "Union" power capstans. First medal and a diploma

James L. Jackson & Brother, Twenty-eighth street corner Second avenue, for screw steering apparatus. First medal and a diploma.

David Kirby, Rye, N. Y., for models of yachts. Second medal and a diploma.

Samuel Brown, 114 Wall street, for a boat detaching apparatus. First medal and a diploma.

F. G. Fowler, Springfield, Mass., for a working model of steering propeller. First medal and a diploma.

### FOURTH GROUP.

*Judges*—Messrs. G. W. Hough, James Crowley and Dubois D. Parmelee.

L. Bradley, Jersey City, N. J., for a telegraphic relay. First medal and a diploma.

L. G. Tillotson & Co., 26 Dey street, for a telegraph register. Second medal and a diploma.

The Bishop Gutta Percha Company, 208 and 212 East Twenty-fifth street, for submarine cables. First medal and a diploma.

William R. Allison, Philadelphia, Pa., for a parafine telegraph insulator. Third medal and a certificate.

Thomas S. Hall, Stamford, Conn., for a magnetic railway switch alarm signal. First medal and a diploma.

Jerome Kidder, 478 Broadway, for an electro-medical apparatus. First medal and a diploma.

American Fire Detector Co., 80 Cedar street, for Dion's fire detector. First medal and a diploma.

Samuel Gardiner, 171 Broadway, for an electro gas lighter. First medal and a diploma.

*Judges*—Messrs. John B. Rich and F. E. Engelhardt.

Alfred E. Beach, New York, for a pneumatic postal dispatch. First medal and a diploma.

### FIFTH GROUP.

*Judges*—Messrs. Wm. H. Murphy and T. L. De Vinne.

Milo Peck & Co., New Haven, Conn., for a newspaper directing machine. First medal and a diploma.

Heath, Smith & Co., 282 Pearl street, for a graining machine. First medal and a diploma.

John F. Trow & Co., 50 Green street, for a type setting and distributing machine. First medal and a diploma.

Woods & Tuttle, Boston, Mass., for a printing press. First medal and a diploma.

John Most, Elm street, corner White, for a lithographic press. Second medal and a diploma.

Geo. P. Gordon, 139 Fulton street, for an improved card and bill head press. First medal and a diploma.

### SIXTH GROUP.

*Judges*—Messrs. James L. Jackson and Henry T. Blodget.

Otis Brothers, 307 Broadway, for hoisting apparatus. First medal and a diploma.

John P. Gruber, 181 Chatham Square, for a bank scale. First medal and a diploma.

Herman Kohlbusch, Hudson City, N. J., for diamond and druggist scales. First medal and a diploma.

Charles Van Oeckelin, 2 Depau row, for a tobacco packing machine. First medal and a diploma.

## VII.—DEPARTMENT OF AGRICULTURE AND HORTICULTURE.

*Under the supervision of Messrs.* Wm. S. Carpenter, Nathan C. Ely *and* Jas. Knight.

First Group.—Specimens of plants and flowers

Second Group.—Fruits, vegetables, cereals, roots and seeds.

Third Group.—Specimens of food prepared on the farm—butter, cheese, etc.

FOURTH GROUP.—Ploughs, diggers, cultivators, harrows, drain pipe and implements used in preparing the soil; pruning knives, and all implements for cultivating plants and trees; hot house apparatus.

FIFTH GROUP.—Mowers, reapers, scythes, and implements used in gathering the products of the soil; threshing machines, corn shellers and grain mills.

SIXTH GROUP.—Churns, cheese presses, and all articles used in dairy, farm house and farm stable, not elsewhere enumerated.

SEVENTH GROUP.—Specimens of products of the soil used in the arts—wood, hemp, flax, cotton; specimens of animal growth—wool, silk, hair, feathers, down, horn, bone; live animals, whenever the Board of Managers decide to admit them.

### FIRST GROUP.

*Judges*—Messrs. H. DOE and ISAAC BUCHANAN.

C. S. Pell, Orphan Asylum, Bloomingdale road, near West Seventy-third street, for a collection of dahlias. Second medal and a diploma.

A. G. Burgess, East New York, L. I., for a collection of dahlias. Second medal and a diploma.

Mrs. Wilson, Bloomingdale, N. Y., for a collection of dahlias. Third medal and a certificate.

A. M. Henning, Llewellyn Park, Orange, N. J., for a collection of dahlias. Third medal and a certificate.

Hanft Brothers, 697 Broadway, for a basket of choice flowers. Second medal and a diploma.

William A. Burgess, Glen Cove, L. I., for a collection of roses, many new seedlings. Second medal and a diploma.

L. L. Whitlock, 245 Broadway, for a collection of plants. Second medal and a diploma.

### SECOND GROUP.

*Judges*—Messrs. H. DOE and ISAAC BUCHANAN.

#### FRUIT.—*Professional.*

C. M. Hovey & Co., Boston, Mass., for a collection of 73 varieties of pears. First medal and a diploma.

William L. Ferris, Throg's Neck, N. Y., for a collection of 55 varieties of pears. Second medal and a diploma.

#### *Amateur.*

C. Dickerman, New Haven, Conn., for a collection of 55 varieties of pears. First medal and a diploma.

S. Springstead, Union Port, N. Y., for a collection of 19 varieties of pears. Second medal and a diploma.

S. C. Barnes, Kent avenue, Brooklyn, L. I., for a collection of pears. Second medal and a diploma.

#### *Professional.*

William L. Ferris, Throg's Neck, N. Y., for a collection of apples. Second medal and a diploma.

E. Williams, Montclair, N. J., for a collection of fruit. Second medal and a diploma.

### VEGETABLES.

*Judges*—Messrs. JOSIAH H. MACY, N. C. MEEKER and S. EDWARDS TODD.

D. S. Heffron, Utica, N. Y., for a collection of 105 varieties of potatoes. First medal and a diploma.

Reisig & Hexamer, Newcastle, N. Y., for a collection of potatoes. Second medal and a diploma.

### FOURTH GROUP.

*Judges*—Messrs. JOSIAH H. MACY, N. C. MEEKER and D. S. HEFFRON.

S. W. Valentine, Bristol, Conn., Peck & Seymour, agents, 299 Pearl street, for grape and flower scissors. Second medal and a diploma.

Collins & Co., Hartford, Conn., for steel plows. First medal and a diploma.

H. L. Lowman, Washoe Tool Company, 166 Chambers street, for miners' and railroad picks. First medal and a diploma.

F. M. Hexamer, Newcastle, N. Y., for a prong hoe. Second medal and a diploma.

Knight & Woodward, 10 Reade street, for cement sewer pipe. First medal and a diploma.

D. W. Seeley, Albany, N. Y., for drain pipe. First medal and a diploma.

Henry Seymour, 52 Beekman srreet, for hedge pruning and sheep shears. Second medal and a diploma.

### FIFTH GROUP.

*Judges*—Messrs. JOSIAH H. MACY, N. C. MEEKER and D. S. HEFFRON.

Adriance Platt & Co., 165 Greenwich street, for a combined mower and reaper with self rake. First medal and a diploma.

A. C. Hasbrouck, Highland, N. Y., for a mowing machine knife sharpener. Second medal and a diploma.

R. H. Allen & Co., 197 Water street, for a wind mill, "Empire." Second medal and a diploma.

Oscar Washburn, Sing Sing, N. Y., for a hay rake. Second medal and a diploma.

Greenwood Scythe Company, New Hartford, Conn., for scythes. First medal and a diploma.

R. H. Allen & Co., 191 Water street, for Burrell's corn sheller. First medal and a diploma.

Thomas Butterworth, Shelbyville, Mo., for a corn harvester. First medal and a diploma.

*Judges*—Messrs. JOSIAH H. MACY, WM. H. SMITH and SAMUEL G. HAVILAND.

Amos Newell, 170 Broadway, for a combined cylindrical harrow and broadcast seed sower. First medal and a diploma.

### SIXTH GROUP.

*Judges*—S. EDWARDS TODD, JOHN CRANE and E. WILLIAMS.

J. R. Decatur, 197 Water street, for Hutchinson wine and cider press. Second medal and a diploma.

Elastic Horse Shoe Cushion Company, A. B. Gray, agent, 201 Broadway, for elastic horse shoe cushions. Second medal and a diploma.

J. W. Douglass, 181 Water street, for Cliff's aerating churn. Third medal and a certificate.

J. R. Decatur, 197 Water street, for Tingley's patent churn. Third medal and a certificate.

Warren Gale, Peekskill, N. Y., J. R. Decatur, agent, 197 Water street, for a a hay and straw cutter. Third medal and a certificate.

J. W. Douglass, 181 Water street, for Butterworth's Jersey apple grinder. Third medal and certificate.

Denzler & Miller, Brooklyn, L. I., for an automatic manger and feed box. Third medal and a certificate.

J. W. Fiske & Co., 120 Nassau street, for copper weather vanes. Third medal and a certificate.

G. L. Cummings, 148 Centre street, for a carriage jack. Third medal and a certificate.

J. V. Henry Nott, 49 Wall street, for a bag holder. Third medal and a certificate.

David H. Priest, Watertown, Mass., for a patent fruit basket. Third medal and a certificate.

H. L. Chase, Bath, Me., for a cover for pickle barrels. Third medal and a certificate.

J. S. Patric, Rochester, N. Y., N. A. Taylor, agent, 40 Fulton street, for an automatic pump for stock. First medal and a diploma.

### SEVENTH GROUP.

*Judges*—Messrs. S. EDWARDS TODD, JOHN CRANE and E. WILLIAMS.

Treadwell & Co., San Francisco, Cal., L. P. Rose, agent, 170 Broadway, for California vegetable hair. First medal and a diploma

# REPORTS OF JUDGES

## AT THE

## EXHIBITION OF 1867.

A majority of the reports made by judges to the board of managers were expressed in such brief terms, that their publication would give the reader an incomplete conception of the productions under examination. In other cases, where the judges had the time and opportunity to make compartive tests of articles on exhibition, and to give a detailed description of them, their reports contain many points of special interest which give them a permanent value, and it seems proper that they should have a place among the published Transactions of the Institute. The following are copies of the more essential portions of these reports.

### Department I.

### THIRD GROUP.

*To the Board of Managers, American Institute, Thirty-seventh Annual Exhibition:*

Your committee on the Photographic department, in assigning the first position to No. 1,006—the collection of Messrs. Huston & Kurtz—would speak in high praise, both of the general excellence of their exhibition, and the superiority of their colored porcelain pictures in particular. By their method of preparing the porcelain for the reception of color, they are enabled to give great delicacy and finish to their work. In their manipulations of the new and valuable carbon process, which aims at greater permanency and a more delicate rendering of light and shade, they exhibit more than usual care, good taste and artistic perception.

The committee would also speak in high terms of No. 778, the collection of Messrs. Wenderoth, Taylor & Brown, of Philadelphia. Many of their colored porcelain pictures, and their specimens in the carbon process, are deserving of great praise. They would designate, in particular, a colored porcelain picture of a lady in vignette, with a wreath of red, white and blue roses. Also the admirable carbon print of Gen. Grant, and an imperial card group of three persons.

Your committee would assign the highest position in plain photography in silver prints, to G. G. Rockwood, Esq., his exhibition being an interesting and valuable one in several particulars. No. 992, life-size photographs, are very good, showing great care and skill in the enlargement process.

The specimens of landscape photography are excellent and well manipulated. They would designate, in particular, the view of "Pelham Priory," and the large size photograph, No. 990, of the building of the United States Watch Company—the great size of the plate used, 42x26 inches, requiring unusual care and nicety. Mention should also be made of the excellence of the photograph of the "Good Samaritan," a copy from the group by Quincy Ward, Esq.

The exhibition of Messrs. Gurney & Son, of imperial card pictures, is a very fine one, showing careful manipulation, skillful lighting and artistic posing.

Your committee would call especial attention to the improved photo-lithographic process of J. W. Osborne, Esq. For the reproduction of manuscripts, pen and ink drawings, wood cuts, etchings and printed matter in general, it leaves nothing to be desired. In addition to its immediate practical value, it will be of the first importance in duplicating copies of drawings made by the old and new masters; thus placing a most desirable branch of the fine arts within the means of the many.

D. HUNTINGTON,
H. C. SHUMWAY,
JOHN M. MASTERTON, } *Judges.*
EDWARD WILSON.
A. WETMORE, JR.

## Department II.

### FIRST GROUP.

### COOLING, LIGHTING, ETC.

Of the twenty-five articles referred to us, we judge eleven to be worthy of much praise.

But few refrigerators are shown. The "Zero," No. 582 (A. M. Lesley), is the best. We esteem it the best we know, not so much by possessing novel features of great merit, as by being an extremely well devised, effective and economical construction. The principles it involves are long tested and approved. It preserves the meats and vegetables at a low temperature, with the consumption of less ice than any other known to us.

The Ventilating and Air Purifying Device, No. 584 (A. S. Lyman), seems to us entitled to attention. Air is passed through charcoal and other purifying agencies by the increased gravity due to its being cooled with ice, and it is finally poured in an extremely delicate current on the head of the patient in bed. The motion is perceptible only by delicate tests, and we believe the effect of this apparatus may in many cases, turn the scale of life or death. It is the best article exhibited relating to ventilation.

B. J. Burnett's Ventilators, No. 869: This system of ventilation is represented by five models—a combination ventilator, using concealed pipeages to and from each apartment; combined lights and ventilators for ships, forming triple transverse supports to the glass against the pressure of the sea, with rubber packing; sky-light ventilator for houses, where the hall-way extends uninterruptedly to the roof; a ventilator for churches, giving pure air in any area through what the patentee calls a "diffusing hood;" and the hexagon ventilator, harmonizing with a florid style of architecture. Mr. Burnett deserves much credit for his successful labors in this all important department of practical science. His ventilators develop an economical phase, seeing that by their adoption, cock lofts and upper sleeping apartments of a house may be rendered as comfortable and pleasant as any other portion of the building, both in summer and winter, with unexcelled power of graduating the velocity and amount of circulation.

No. 786 (J. P. Frink), shows a mode of ventilation in connection with gas lights which has come to be highly approved.

No. 749 (Tucker Manufacturing Company) includes a splendid collection of chandeliers, made from cast iron, and cheaply bronzed by a patented process, by the scorching of oil on the surface. If he is a public benefactor who causes two blades of grass to grow where one grew before, very high credit is due to the manufacturers of these rich and permanently elegant goods from such insignificant materials. If the bronze coating is not liable to fail, or other evil to arise through the liability of iron to oxydize, the invention is almost invaluable. We esteem this the best exhibition of chandeliers.

Frink's Gas and Daylight Reflectors, No. 786, are a standard manufacture of great merit. These gaslight reflectors are taking the place of chandeliers very extensively, and the daylight reflectors are almost equally meritorious. While we are not prepared to certify to any remarkable novelty in reflectors, the principle as applied here is of great beauty and practical utility, and is exhibited on a scale commensurate with its vast importance. As we cannot avoid building compactly, contrivances for diffusing light into otherwise dark rooms are invaluable. These reflectors are the best known to us, both in style and workmanship, and are destined to become an important adjunct in lighting and ventilating public buildings.

No. 503 (J. K. Kramer) includes four rich specimens of ornamental lanterns or lamps adapted for burning gas. They are the best exhibited.

What we esteem the most important display in this department, is that made under No. 545, by Julius Ives & Co. This firm has, by a series of improvemets, adapted lamps practically and safely to the burning of the omnipresent kerosene, with an improved arrangement for filling, with convenient and highly ingenious provisions for removing and replacing the chimney and shade, with improved means for adjusting the height of the wick, and finally, adapting lamps to apply on the same chandeliers as are employed for gas, so that a man may arrange his house for gas and light with kerosene, or *vice versa*, in other words he may introduce the gas fixtures in advance, and light with lamps attached thereto until the progress of improvements brings the gas mains to his locality. The assortment includes hanging lamps, hall lamps, bracket lamps, and table or portable lamps. They are, we say without hesitation, the best in the world.

Messrs. Bradley & Hubbard, of West Meridan, Conn., are the inventors of an improved device for raising and lowering lamps, exhibited in this collection. These makers also exhibit some very tasty and finely finished chandeliers.

No. 1081, Willard's Patent Taper Burner, we pronounce the best burner for this purpose known to us. It opens and shuts by a simple and apparently reliable mechanism, to change the burner from an ordinary lamp capable of giving the full light due to its size and wick down to a very small taper just sufficient for a sick room. In the use of ordinary burners, a portion of the kerosene escapes unconsumed, and gives an offensive smell to the apartment, if the lamp is used when the wick is very low. Several attempts have been before made with indifferent success to accomplish what this seems to have done perfectly, in enclosing the open end of the wick to prevent any escape of vapor except at a very small orifice. The small flame designated a taper burns through this orifice; and when it is desired to increase the light, it is at once opened out into the condition of an ordinary wick. The parts previously serving as a cover, now become ineffective, or possibly aid a little in warming the air and deflecting it properly on the flame. We cannot too highly praise this arrangement generally. The means of operating are so convenient that the cap may be applied instantly by a movement of the thumb whenever the lamp is grasped to be moved about the house. All familiar with kerosene know the trouble involved in the necessity for readjusting the lamp at commencing and ending each movement in order to secure the full brilliancy when standing still, without smoking when in motion; a difficulty completely avoided by this construction.

No. 1037, H. Danforth's Atmospheric Lamp, is a beautiful and successful invention. It being necessary to supply air for a kerosene lamp more rapidly than it will naturally be drawn by an open flame, chimneys are usually provided to isolate the rarified air and induce a more active current; but chimneys, even in their cleanest condition, absorb and reflect a portion of the light. This invention introduces clock work in the base of the lamp, which accumulates in its ample spring a stock of power on winding, which turns a little fan and blows the flame by a sufficiently active current led up from below, and a draft similar to that of the chimney, is obtained without any obstruction to the light. The flame burns white, clear, and motionless. The lamps exhibited are noiseless. The cost of the lamp, with the accompanying mechanism, should not forbid their introduction, though it will doubtless retard it.

No. 1019, C. F. A. Hinrich's Study Lamps, are very well devised and convenient lamps, having the shades and attachments in accordance with a highly approved German pattern. They are richly finished and are the best lamps of the kind we have seen.

THOMAS D. STETSON,
JAS. B. OGDEN,
IRA L. CADY.
} *Judges.*

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### SECOND GROUP.

GENTLEMEN—The undersigned, judges in Department II, Group 2, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advancement and improvement in the methods used to accomplish a desired end. We find the majority of articles in Department 2, Group 2, unworthy of either honorable mention or a premium, and therefore ignore them altogether in this report, and mention only those deemed worthy of consideration. Your committee of judges for this group have visited the Institute on several occasions, both day and evening, and could not find any person to explain the merits of the articles they had entered for exhibition, in the majority of cases, the owners seeming to consider them in the same light as the judges, viz: of no particular account. The following are the articles which the judges deem worthy of mention, viz:

No. 228. (*H. F. Forbush & Co.*) BREAD KNEADING AND MIXING MACHINE.—This appears a very useful invention, and has the merit of doing its work thoroughly and effectually. It requires but about ten minutes to mix and thoroughly knead for baking. It is very easily cleaned; in fact, it is a self-cleaner, and its moderate cost will place it in the hands of most families who prefer their own made bread to that made by bakers. We think it worthy of a first premium. (*Value, 2d class medal.*)

No. 782. (*Mrs. H. H. Cole.*) FLUTING MACHINE.—This is the only article of the kind on exhibition, invented by an American, being the invention of its exhibibitor, Mrs. Cole. We consider this superior to any machine of the kind in use; its merits being a lever, graduated by a weight instead of a screw or foot pressure, which makes it work more uniform, and not so liable to injure the article fluted. We think it worthy of a first preminm. (*Value, 2d class medal.*)

No. 1175. (*Steele & Co.*) FEATHER DUSTERS.—Of this article there is a splendid display, and the quality of the goods, in the opinion of your judges, is superior to all others known to your committee, and is worthy of a first class premium.

No. 1151. (*D. H. Goodell.*) LIGHTNING APPLE PARER.—Your committee tested this article (together with all others made known to us) thoroughly, by actual use, and find it surpasses all others in the time required to do its work; that it throws the paring from the machine, which others do not, and that its knife is better adapted to pare a crooked or uneven apple than any other. We therefore deem it worthy of the first premium. (*Value, 2d class medal.*)

No. 166. (*P. Miles.*) MINCING MACHINE AND MEAT CUTTER.—This is the invention of Mr. P. Miles, and, in the opinion of your judges, is superior to any other invention of the kind known to your committee. Its merits over others are many, but the limited space in our report will only allow us to mention its leading advantages. Its construction is such that the knives are easily taken out and sharpened, and it cuts the meat *thoroughly* and not *in strings*, as nearly all others do. It is a self-cleaner (an advantage that no others have), for when meat ceases to be fed to this machine, it all passes out, evenly cut. Its inner surface being enameled, is very easily and effectively cleaned. We deem it worthy of a first class premium.

No. 419. (*Fell, Evans & Co.*) COMBINATION TACK DRIVER AND CARPET STRETCHER.—This article is a novel and useful invention, doing its work thoroughly. Its merit over all others of the kind is, that it first stretches the carpet, and without removing it, the tack is driven by the hammer with perfect ease. We consider it worthy of a first premium. (*Value, 2d class medal.*)

No. 630. (*John Burgum.*) DEVICE FOR KEEPING BEEF UNDER BRINE.—This is a novel and very useful invention, very effective in doing the work intended, and perfectly simple in its construction, and we think worthy of a third class premium.

No. 492. (*American Papier Mache Manufacturing Company.*) PAPER MACHE PAILS, BOWLS, &C.—These articles appear very good, but no person being present to answer our inquiries, we are unable to give their merits. We think, from an examination, however, that they will do good service, and consider them worthy of a third class premium.

No. 1239. (*Excelsior Manufacturing Company.*) EUREKA CONDENSING COFFEE POT.—This is one of the many coffee pots on exhibition, and in order for your judges to arrive at a positive conclusion as to which *one* was best, we selected the three most prominent and tried them by actual test, and find the "Eureka," No. 1239, to be *the best.* It is the simplest and most complete, making a better coffee, for the quantity used, than any other. It condenses the steam, and thus saves the aroma, and therefore entitled to the first premium. (*Value, 2d class medal.*)

No. 210. (*E. K. Sargent.*) ALARM COFFEE BOILER.—This is an excellent article, being a perfect steam condenser, thus saving the aroma, making an excellent coffee for the quantity used, and has, besides, for its merits, an alarm whistle, telling when the coffee is sufficiently boiled, which is certainly an improvement. We think it worthy of the second premium. (*Value, 3d class medal.*)

We also consider the following articles worthy of honorable mention:

No. 962. (*New York Stoneware Company.*) STONE AND EARTHENWARE.—A good article, and very handsomely finished.

No. 345. (*E. Richmond.*) RACKS FOR WHIPS, BROOMS, BRUSHES, &C.—This article is an improvement for holding the articles named, whips in particular; and for them, the most desirable article ever offered to the public.

All of which is most respectfully submitted.

WILLIAM H. CROSSMAN,
GEO. W. VAN TINE,
HENRY A. PATTERSON,
} *Judges.*

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*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department No. II, Group No. 2, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

The whole number of washing machines, mangles and wringers on exhibition is forty-one. Of these, thirty-nine are entered for competition. The articles bearing the numbers 897-8 (H. E. Smith), are decided to be the best on exhibition. It must also be stated incidentally that these are better than any of their class known to the judges. Their merits are:

*First*—They perform their work without rubbing or pounding, and with no more wear or friction than is created by the current of water forced through the clothes, so that the most delicate laces and curtains can, if necessary, be washed with the coarsest fabrics, without the slightest injury, and without entangling or straining.

*Second*—Clothing infected by the most contagious diseases, bandages of wounds and sores, and all kinds of impure articles are entirely purified without risk to the operator.

*Third*—There is no slopping of water, whether the machine is open or shut, but when closed it confines the steam, and keeps the water hotter than by any other known process.

*Fourth*—While other machines will wash a single or a few articles better than a large quantity, the hydraulic washer performs its work as thoroughly when run at its full capacity, as otherwise.

*Fifth*—A set of the power machines (like those on exhibition, and numbered in your catalogue 897), with two hands, will wash five thousand pieces of average hotel washing in twelve hours.

*Sixth*—It is as simple as possible in its construction; is not liable to get out of order; is easily operated, and will last for years, if properly used.

*Seventh*—They can be readily attached to the boiler of any kitchen range.

*Eighth*—Both the power and hand machines (which are now on exhibition) are made on precisely the same principle; and, to enable all classes to avail themselves of their advantages, it is expected to supply them at prices varying from $25 to $500, with the patent wringer.

No. 1059. C. H. HALE'S PATENT ADJUSTABLE WASHER.—Second to No. 897, and deserving of the second premium.

No. 496. (*N. B. Phelps.*) EXCELSIOR FAMILY WRINGER.—A. No. 1 machine, and deserves first premium.

No. 43. (*R. C. Browing.*) FINE CLOTHES WRINGER.—Second only to Nos. 496, 497 and 495.

No. 1165. (*G. Moulton.*) "EUREKA" CLOTHES WRINGER.—Self-adjusted by steel springs; simple, cheap, and worthy of notice for small family washings.

WM. W. SANGER, M. D.,
HENRY T. BLODGET,
RICHARD CHENERY,
R. B. COLEMAN.
} *Judges.*

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*To the Board of Managers:*

GENTLEMEN—The undersigned, judges in Department II, Group 5, report that they have examined carefully the several articles referred to them, and the following is the result of their deliberations:

SILVER PLATED WARE.

Entry No. 452. Davis, Collamore & Co.
532. George H. Kitchen & Co.
600. E. D. Bassford.

We understand that no premium can be given to No. 452, owing to the fact that Mr. Collamore is one of the officers of the Institute; and further, we are told that his goods are of the same manufacture as those of Messrs. Kitchen & Co. Between the goods of Messrs. Kitchen & Co. and those of E. D. Bassford, made by Messrs. Read & Barton, your judges had great difficulty in deciding, both being eminently worthy of premiums. More of the goods of Read & Barton were plated on white metal, a material on which workmanship cannot be shown with the same facility as on German silver. Both exhibitors show goods of exquisite finish and design, but your judges are compelled to award the first premium a first class medal to the goods manufactured by Read & Barton, entry No. 600. We decide the goods, entry No. 532, to be worthy a second class medal.

CHINA, DECORATED, AND ENGRAVED AND CUT GLASS.

Entry No. 453. Davis, Collamore & Co.
532. George H. Kitchen & Co.
871. William L. Quinnell.

No sufficient show of china was made to deserve a premium; but the exhibitions of cut and engraved glass, made by entries Nos. 532 and 871, are the most beautiful we have ever seen. The engraving on glass, in entry No. 532, was far superior to that of the other exhibitors, sufficiently fine to atone for the loss of ancient arts in decorating glass; but the cutting in 871 was superior, and we learn was done by the exhibitor.

We consider the entries both entitled to premiums, one for cutting, the other for engraving, and award to entry No. 871, a first class medal; to entry No. 532, a second class medal.

### TINWARE.

Entry No. 598. E. D. Bassford.

Your judges did not find the tinware exhibited to be superior to that found ordinarily in the market, and do not consider it worthy of a premium.

### EARTHENWARE.

Entry No. 599. E. D. Bassford.

Your judges consider the manufacturers of the goods in this entry to be deserving of credit for an honest effort to excel foreign manufacturers, but do not consider that they have attained sufficient success to deserve a premium.

### FRUIT JARS.

Entry No. 165. John J. Squire.
704. George W. Ramsey.

Your judges consider the jars exhibited in these entries to be valuable, but not sufficiently superior to others, well known in the market, to entitle them or either of them to premiums.

### SHARPENING STEELS.

Entry No. 420. Daniel Romer.

The steels in this entry are of beautiful mechanical finish, and the inventor deserves great credit for bringing out by machinery an article of this quality. We judge him worthy of honorable mention.

### TABLE CUTLERY.

Entry No. 645. Clement, Hawkes & Maynard.

Of the cutlery exhibited in this entry, we cannot speak in terms too high. It shows finer fittings, finish and taste than any cutlery ever examined by your judges, whether of American or foreign manufacture. In this department it affords particular pleasure to see American goods excelling the skill and elaboration of the old world. We consider the entry 645 to be worthy the first premium, a first class medal, and should award it without hesitation were we not debarred by the rules of the Institute, denying premiums to managers.

POCKET CUTLERY.

**Entry No. 674. D. E. Smith & Co.**

This entry shows a great improvement in American made pocket cutlery. It is equal to the best foreign make in appearance, style of finish, grinding, and the mechanical workmanship shown in the joints and backs. We consider it worthy the first premium, a second class medal.

FILTERING CUPS AND GOBLETS.

**Entry No. 712. C. Arthur Totten.**

The inventor shows a valuable improvement in cups and goblets, adding a filter in such manner as not to detract from the taste and elegance of the finest articles of the kind. We consider him worthy the first premium on this invention, an honorable mention.

FANCY ENAMELED GOODS.

**Entry No. 740. W. C. Peckham.**

Your judges were not favored with a description of the merits, or a chance to handle the goods, but the appearance was commendable; and for the mode of making cheaply articles of general utility, your judges consider the entry entitled to a third class medal.

FANCY TURNED ARTICLES OF WOOD.

**Entry No. 1068. E. Knabschurch.**

The goods of this entry have an exquisite bronze finish, and for taste and elegance of design, your judges consider them worthy the first premium. (*Value, a 2d class medal.*)

Very respectfully,

HENRY WINN,
WM. H. CROSSMAN,
THOMAS E. GAYNOR. } *Judges.*

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## SEVENTH GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned, judges in Department II, Group 7, report that they have carefully examined the several articles referred to them, and that the following is the result of their deliberations:

No. 1031. Lead-encased Block Tin Pipe. (Colwells, Shaw & Willard Manufacturing Company.) Is the most valuable invention we have seen at the fair.

The encased block tin tube is made of any desired thickness, is perfectly uniform throughout the entire length of the pipe, and is firmly and completely united to the encasing lead by an intervening layer of solder, which makes separation impossible.

The strength of the tin and its low density as compared with lead, make it possible to diminish the weight of the combined tube by fifty per cent, and the lead-encased block tin pipe, although weighing hardly half as much per foot as lead pipe of the same internal diameter, is still capable of withstanding a greater pressure without bursting.

This tube combines really all the good qualities of both lead and tin; it is stronger, as flexible, and cheaper per foot than lead pipe, while it completely protects those who use it from the insidious lead poisoning, which is liable to occur whenever lead pipe is used for conveying water for domestic purposes.

We consider this the most perfect tube for conveying water yet invented, and believe that its great sanitary importance entitles its inventors to the highest premium given at this fair.

No. 1022. Specimens of Water Pipe. (J. K. Mayo.) Very ingeniously formed, strong and cheap. Its durability can only be proved by the test of actual use; it will depend on the character of the cement used to unite the layers of wood, on the thickness of the internal coating of asphaltum, and on the lining of cement.

No. 97. Portable Shower Bath. (H. W. Pond.) Its merits are cheapness, simplicity and durability. Will be particularly useful where water is not abundant. Is the best of its class known to the judges.

No. 124. Stationary Water Closets. (H. H. Craigie.) Is decided to be the best on exhibition, and the best known to the judges. The water jet attachment is particularly meritorious, though it might be improved.

C. F. CHANDLER,
JAMES INGRAHAM, } *Judges.*
W. K. THOMAS,

No. 688. Double Dial Improved Lock. (Linus Yale, Jr.) Is decided the best on exhibition. Its merits are: 1. That it cannot, as far as the judges can discover, be picked by any known method of lock-picking. 2. That the whole circumference of the tumblers can be utilized for changes of combination. 3. That the tumblers can be arranged for opening the lock by turning the register spindle in either direction at pleasure. 4. That the drilling out or removal of the spindle, if such a thing be possible, does not give access to the lock. 5. That owing to the duplex system of locks acting upon the same bolt in such a manner that the unlocking of either will permit the bolt to be retracted, the difficulties often arising from locks getting out of order and thus preventing the opening of doors by authorized persons are entirely obviated.

The locks hereafter enumerated are also worthy of notice.

*First.* The Double Treasury Vault Lock, No. 688, it having, although a key lock, the advantages set forth under the first and fifth heads as above.

*Second.* The deed box, or safe compartment, or cash drawer lock, Improved Bramah, No. 688. This lock has all the advantages of the well known Bramah lock, and in addition thereto the quality of being unpickable by any means known to the judges. The devices by means of which this great desideratum is effected are simple in the extreme, and not liable to derangement; they, moreover, add but little to the cost of the lock. This lock, it is believed, will supply a want which has long been felt, and which, up to the present time, has not been satisfied.

*Third.* The Safe Lock, No. 486. (Joseph Corbett.) The judges are not certain that this lock cannot be picked by well known methods, but think that the improvements aiming to prevent false registry as a means of picking, and preventing inspection of the register while the lock is being locked or unlocked, except by the person operating it, are ingenious; and that the latter improvement is a valuable adjunct to register locks used by careless persons, or those not always upon their guard against felonious attempts to open them.

HENRY B. RENWICK, } *Judges.*
SAMUEL HAMMOND, }

## Department III.

### FOURTH GROUP.

### SEWING MACHINES, ETC.

*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department III, Group 4, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

The whole number of sewing machines on exhibition is thirteen; of these twelve are entered for competition. The article bearing the number 730, (Florence Sewing Machine Company) is decided to be the best on exhibition. It must also be stated incidentally that this is better than any of its class known to the judges. Its merits are: 1. A good material and thorough workmanship. 2. More absolute novelty than marks the usual improvements in sewing machines. 3. The ingenious arrangement by a positive motion, for adjusting the thread during the passage of the shuttle, and the gathering up of it in the finish of the stitch. 4. The reversible feed. 5. The variety of work which can be done upon it.

We therefore recommend that it receive award of first class. We would further add that this machine, in our opinion, is as good as the best known to us.

Nos. 823, 824, 825 (Bruen Manuf. Co.) have elicited our admiration, both for ingenuity of device and good workmanship. Their facility of application to other machines, producing great variety of work, makes them desirable additions. We commend them to honors of the third class.

No. 980 (Elliptic Sewing Machine Co.) is decided to be entitled to honors of the second class. We consider it a decided improvement upon the machine whose type it bears: the device of the hook, and the improvement in the feed bar, being decided simplifications both in manufacture and durability. The workmanship is excellent.

The article bearing the number 367 (Bartram & Fanton Sewing Machine Co.) is decided to be one of the best on exhibition. It must also be stated incidentally that this is better than any of its class known to the judges. Its merits are: 1. Extreme simplicity of design. 2. Good substantial workmanship. 3. The positive character of its motions. 4. The very ingenious device for making button holes, and for making them well. 5. The equally ingenious device for sewing on buttons. 6. The simple and efficacious device for tension of the thread. 7. The facility with which this machine can be made by the system of duplication.

We therefore strongly commend it to honors of the first class.

The article bearing the number 983, (Empire Sewing Machine Co.,) is a simple and desirable machine. The cam motion for operating the needle is ingenious, and the operation of the needle through this and the connection of the peculiar "take up" on the thread, commend it to second class honors.

The article bearing the number 817 (Stackpole Manufacturing Co.) is decided to be a highly ingenious and meritorious machine. It presents the novelty of a duplex attachment, which allows two rows of stitches to be formed at the same time. This duplex attachment is worked by the same mechanism as that which drives the single needle, and it is easily detached and put on. The *variable feed motion* allows work on circular seams, or stitching to be worked on any radius, by simply arranging the relations of the feed bars one to the other. The tripping of the needle for the purpose of threading is a good feature. We commend the above machine to honors of the second class.

The article bearing the number 809 (J. W. Bartlett) is decided to be a good simple machine, and of a class that is desirable on account of its cheapness and simplicity. Its principal noticeable feature, otherwise, is that it can be run in both directions without injury. We commend it to third class honors.

The article bearing the number 606 (Halligan & Shapter) is for sewing leather, with waxed or unwaxed thread, and is the only one of its class on exhibition. It is a highly ingenions machine, and its several motions are admirably adapted for the kind of work it performs. The excellence of the machine and the importance of the branch of manufacture for which it is intended, cause us to commend it for first class honors.

The article bearing the number 799 (Miss Jane Gray) is recommended to notice by a very ingenious feed font, and the equally ingenious attachments for embroidering in great variety, and fringing. The novel feature's for the above purposes will commend it to second class honors.

Rolling Platforms for Sewing Machines, number 973 (Sibley & Stoops). Its merits are simplicity of construction, firmness of the platform on the floor when the roll is locked, and freedom of motion when it is unlocked, for moving the machine. Third class honors.

Tuck Creasers, number 360 (Fuller & Barnum). Its merits are: 1. That its parts are free and simple in form. 2. That its motion is precisely the same as that formed by hand, and with the rapidity of sewing machine motion, and without injury to light fabrics, which has not been the case with tuck creasers hitherto made. 3. The facility with which it can be attached to any sewing machine.

A very ingenious device for the purpose, and recommended to second class honors.

Guides or Self-sewers for Sewing Machines, number 818 (G. F. Clemons). Its merits are: 1. Simplicity. 2. Ease of attachment to the machine. 3. The facility and promptness with which it acts on the cloth, changing its direction as it passes the machine in sewing. Recommended to second class honors.

Charts or Devices for Cutting Dresses. The article bearing the number 1020, (James McCall,) is decided to be the best on exhibition. It must also be stated incidentally, that this is better than any of its class known to the judges.

Your committee have very carefully examined the Royal Chart for fitting dresses, and have compared it as far as possible with other systems—most if not all of which originated with the inventor of this. It appears to be as near an approximation to perfection in this art as is possible. In view of the importance of the branch of art or manufacture which this invention advances, we cordially commend it to first class honors.

WM. PRATT,
IRA L. CADY, } *Judges.*
L. J. KNOWLES.

## KNITTING MACHINES, ETC.

*To the Board of Managers:*

Gentlemen—The undersigned judges in Department III, Group 4, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised, in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

The whole number of knitting machines on exhibition is four; of these, four are entered for competition. The article bearing the number 709 (Hinkley Knitting Machine Company), is decided to be the best of its class on exhibition. It must also be stated incidentally that this is better than any of its class known to the judges. Its merits are extreme simplicity, non-liability to derangement, cheapness in manufacture. The work made by it is exceedingly good, and of such variety as meets the wants of the most numerous class in the community. We do not classify this machine in comparison with the others on exhibition, because the end in view in its construction, gives it a different field for use, and not necessarily a conflicting one.

We recommend this machine for first class honors.

The article bearing the number 727 (Bridgeport Knitting Machine Company), is decided to be the best of its class on exhibition. It must also be stated incidentally that this is better than any of its class known to the judges. Its merits are, that it knits circular work, with less use of the needle in sewing, than in machines which knit the work flat, and require seaming afterwards.

The machine is highly ingenious and well constructed. We commend it to first class honors, and upon its merits, and not in comparison with others, occupying a different range of work.

The article bearing the number 887 (Lamb Knitting Machine Company), is decided to be the best of its class on exhibition. It must also be stated incidentally that this is better than any of its class known to the judges. Its merits are: 1. Highly ingenious arrangement of the parts composing the machine. 2. The mechanical execution of the work. 3. The positiveness of its motions. The work made by this machine is of great variety, and of excellent quality, but its expense will keep it from that numerous class of consumers who require for the family, a family knitting machine. For manufacturing, it is undoubtedly unequalled.

We commend this machine to first honors upon its own merits, and not in comparison with those occupying other fields.

The article bearing the number 278 (U. S. Patent Button Machine Company (is decided to be the best on exhibition. It must also be stated incidentally that this is better than any of its class known to the judges. Its merits are, that it fastens the button to the cloth without sewing, the eye being so constructed, that by a simple swedge blow the metal is turned over the counter-sink hole in the centre of the button. In clothing establishments where large numbers of buttons are required to be mounted, this machine and its proper button must be economical and useful. We commend it to honors of the third class.

WILLIAM PRATT,
IRA L. CADY,
L. J. KNOWLES. } *Judges.*

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## FIFTH GROUP.

### ARTIFICIAL LIMBS, SURGICAL APPLIANCES.

*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department III, Group 5, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

No. 238. A. A. Marks' Artificial Limbs have frequently been before the Institute, and continue to sustain their former reputation. There being no competition, probably a diploma would be sufficient acknowledgment of his merits.

No. 430. Fry's Breast Pump and Cupping Glasses are among the best of their kind. They are, however, without novelty and without competition.

No. 925. The Trusses and mechanical appliances exhibited by Mr. Marsh, continue to present those superiorities which have for so many years placed his instruments at the head of the list. We recommend him, therefore, as a worthy recipient of the first honors in this class.

No. 861. Those presented by Dr. Sherman, for beauty of workmanship, apparent utility, and considerable novelty of principle, are deemed eminently worthy of public attention, and commendation by this committee. The committee labor under the disadvantage of not having their peculiar principles pointed out by any one thoroughly conversant with them, and further, no knowledge of their actual working. The committee consider these trusses and their appliances deserving of the second premium.

No. 335. The Pomeroy Truss, in our opinion, deserves a diploma.

Two specimens of Invalid and Fracture Beds are exhibited by T. McIlroy (No. 807); and one by Mr. Charles S. Baker, manufacturer (No. 1048), Warren S. Hill, inventor. The committee give their especial commendation to those presented by Mr. McIlroy. They seem to be admirably adapted for invalids' use, and also as adjuvants to surgical skill in treating various fractures of the limbs. They deserve the marked consideration of the Institute.

No. 808. Mr. McIlroy's Operating Table is an exceedingly ingenious table for the use of surgeons. By it, a patient can be placed in any desired attitude, and the efforts of the operator ably seconded. It is without competition, but deserves recognition from the Institute.

A. K. GARDNER, M. D.,
J. V. C. SMITH, M. D., } *Judges*
JOHN J. CRAVEN, M. D.

### ARTIFICIAL TEETH, DENTAL INSTRUMENTS, ETC.

*To the Board of Managers :*

GENTLEMEN—The undersigned judges in Department III, Group 5, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish renewed evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

No. 527. (S. S. White.) Natural shapes, colors, strength, adaptability to the irregularities of the alveolar ridge, and the distinguishing feature in the teeth, specially designed for rubber work, the "headed pins;" which, together with the size of the pin itself, insures the attachment of the teeth to the base with the greatest possible amount of strength.

No. 85. (Johnson & Lund.) These teeth will bear a favorable comparison with those above mentioned, in all features, except in the size of the pins, which, the judges decide, are too small in diameter to secure the greatest strength.

No. 508. (J. Allen & Son.) Strength, durability, cleanliness, and its adaptation to every conceivable physiognomical requirement, in the arrangement of the teeth and the coloring of the gums. The mechanical execution of the pieces on exhibition is excellent.

### DENTAL INSTRUMENTS.

No. 399. (John D. Chevalier & Son.) Adaptability and beauty of finish, which bears out the reputation which the manufacturers have long borne.

No. 727 (S. S. White), compare favorably with the above, in beauty of finish and in all essential qualities.

D. M. DAVIDSON,
E. C. RUSHMORE, } *Judges.*
A. C. HAWES.

## Department IV.

### FIRST GROUP.

*To the Board of Managers:*

Gentlemen—The undersigned judges in Department IV, Group 1, respectfully report that they have carefully examined the several articles referred to them. In deciding upon the comparative merits of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the claims of each. Fully impressed with the idea that premiums should be awarded only for articles of decided excellence, and convinced that by this course alone can the objects of the Institute be attained, the judges have submitted samples from each class to thorough tests, and in some instances to complete analysis, in all cases taking great care to fully inform themselves as to the intrinsic and comparative merits of the substances entered. The following is the result of the deliberations of the judges. Articles of the same class are given in the relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

The article bearing the number 968, manufactured by J. C. Hull's Son, is decided to be the best, for the following reason: That, on analysis, it contains less excess of alkali, which is a matter of the first importance in a toilet soap. This, however, cannot be recommended for a premium, as the manufacturer is one of the board of managers of the Institute.

The samples bearing the number 353, manufactured by Colgate & Co., are regarded as the second in order of merit.

Those numbered 1,097, manufactured by McKeone, Van Hagen & Co., of Philadelphia, are classed as third.

The sample No. 202, Judd's Paraffin Candles, are better than any article known to the judges, and it is respectfully suggested that they are entitled to a first premium.

No. 1133, samples of Lubricating Oil, manufactured by R. A. Cheesbrough & Co. These oils are fully equal in quality to any known to the judges, being perfectly neutral and free from all objectionable features. They are entitled to a first premium.

No. 639. Case of Chemicals distilled from pine wood, is exceedingly interesting in a scientific and practical point of view; but from a want of knowledge of the details of the process, your judges are unable to recommend either of the premiums, but would suggest the propriety of having, in future, a grade of honorable mention.

No. 91. Pyroxylic Spirit, by Julius Pollock, is an article of great merit, superior to any pyroxylic spirit with which your judges are acquainted. It is respectfully suggested that it is worthy of a first premium.

No. 139. W. R. Wyckoff's "Naiad" Water-proof Oil is a good article for the purpose intended, and is worthy of a first premium.

## SECOND GROUP.

No. 941. Apparatus for making pure Soda and Mineral Waters, manufactured by John Matthews, is decidedly the first in order of merit. It is wholly unobjectionable, and produces a beverage free from any deleterious qualities. Your judges would respectfully recommend that it be awarded a first premium.

No. 942. Apparatus for dispensing pure Soda Water, manufactured by John Matthews, is regarded as first in order of merit. The syrup bottles and valves being of such construction as to avoid any contact with metallic surfaces, are worthy of high commendation, and exhibit a marked superiority over any other known form of apparatus. It is respectfully recommended that a first premium be awarded for this article.

No. 870. Soda Water Apparatus, manufactured by Robert Grant, is entitled to a first premium for ingenious and practicable portable apparatus.

No. 944, Somer's Patent Tumbler Washer, your judges regard entitled to a third premium.

No. 1117. Concentrated Alum, manufactured by the Pennsylvania Salt Manufacturing Company, is an article worthy of encouragement, and in the opinion of your judges, entitled to a second premium.

No. 1118. Bi-carbonate of Soda, manufactured by the Pennsylvania Salt Manufacturing Company, is regarded as a meritorious preparation. It is mechanically fine, and commercially pure. Your judges would recommend that it be awarded a second premium.

No. 1098. Fifty samples of Chemicals manufactured by Charles Pfizer & Co., are regarded as first in order of merit, especially iodide of potassium, gallic acid, per manganate of potassa and borax. It is recommended that a first premium be awarded.

No. 1272. Forty samples of Chemicals, manufactured by Rosengarten & Sons, Philadelphia, Pa., are regarded as second in order of merit. The salts of quinine and morphia, bromide of potassium and iodide of mercury, are especially fine, and entitled to a first premium.

No. 765. Chemicals manufactured by L. Martin & Co., Philadelphia, Pa., are regarded as third in order of merit, especially for purity of acids, iron by hydrogen, nitrate of silver, and salts of bismuth. Your judges would recommend that a first premium be awarded.

No. 725. Chemicals, Powers & Weightman, Philadelphia, Pa,, are regarded as fourth in order of merit. The samples of oxide of zinc, morphine salts, and salts of quinine, are entitled to a first class premium.

No. 298. Fertilizers, manufactured by the Mapes Superphosphate of Lime and Guano Company, are decidedly first in order of merit. The "Improved" superphosphate is the best article of its class known to the judges, while the "Nitrogenized" superphosphate is fully equal to the best manufactured. These fertilizers are entitled to the highest award for this class of products, as they are far superior to all others in the exhibition.

No. 439. Commercial Acids, M. Kalbfleisch & Sons. It is recommended that a first premium be awarded for commercial purity and strength.

No. 1119. Phœnix Disinfectant, by the Phœnix Chemical Company, is considered by your judges as entitled to a first premium as a sanitary adjunct.

No. 122. California Wines and Brandy, from Perkins, Stern & Co., are regarded as first in order of merit. It is suggested that a first premium be awarded for hock and claret.

J. G. POHLE,
C. ELTON BUCK, } *Judges.*
JOHN W. MORGAN.

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## THIRD GROUP.

*To the Board of Managers:*

Gentlemen—The undersigned judges in Department IV, Groups 3 and 4, report that they have carefully examined the several articles referred to them, and find in both groups manifestations of decided improvement, as a whole—which are to be found most important contributions to the public wants—entirely new inventions, which promise economy, usefulness, and saving to the public.

They have pleasure in stating that every article on lists 3 and 4, have merit, and are creditable to the producers. Among those most conspicuous, are the improvements upon "house roofing," "cigar making," and the construction of "chimney flues." In the manufacture and samples of plumbago, the establishment of Mr. Joseph Dixon seems to have reached the highest perfection.

No. 196. Case of Goat and Sheep-skin Morocco, from Simmons, Rutter & Co., shows the highest perfection, and demonstrates the ability of our domestic, to compete, in quality of leather and beauty of color and finish, with any similar foreign production. We recommend a first premium.

No. 1035. Your committee notice the beauty of arrangement and artistic excellence of a case of stuffed birds, by John S. Ball, and although not presenting any new feature, seems creditable as indicating perfection in the art.

No. 997. Union Paste, from Union Paste and Sizing Co.; excellent. Recommended for a second premium.

No. 1049. J. E. Almy's Glucine Cement; excellent. Recommended for a second premium.

No. 900, from L. H. Hale, is worthy of special note. The exhibitor has devoted much time and judgment in his department, but the one article called the "Tobaccorette," is a new cheap cigar, which contains all the advantages of a new pipe, a cigar and cigarette, with none of the objections of either—the cost is less; the entire tobacco used in the manufacture is consumed in smoking; the tobacco does not touch the lips; the oil developed in smoking a pipe or cigar is not manifest in smoking the "Tobaccorette." Recommended for highest premium for articles of this class.

No. 844, from F. S. Harzman, is another new invention—a simple cheap machine, with which a child can make cigarettes, and of a far better quality than has hitherto been presented to the public.

This little 75 cent machine is worthy of reward; it will give employment to many, at the same time make a great saving of money to the poor smoker of tobacco. It is stated, and seems apparent, that a skillful person can form forty to fifty cigarettes by its use in one hour. Recommended for a second premium.

## FOURTH GROUP.

No. 1129. H. R. Schanck, inventor. This is declared to be an entirely new roofing material, and is composed mainly of coal tar, flour sulphur, and blue clay. Is cheap, simple, and a promising roofing material, and has attracted special attention of your committee; yet, inasmuch as the invention has not been in public use over one year, it would not be wholly just to award the highest expression of the Institute, at this annual exhibition, inasmuch as so many failures have occurred in attempts to form cheap roofing material. Time and encouragement should both be given to this discovery before an unqualified indorsement is given by the Institute. The agent of the patentee has freely and unreservedly described all the details of the invention and process, and your committee have faith in its ability, and believe it will withstand the effects of climate and atmospheric changes, and be found one of the best cheap roofing yet brought before the public. The composition is also found to be useful in lining wooden tanks, cisterns, barrels, &c.

No. 672. Plastic Slate Roofing, W. L. Potter, inventor. After a careful consideration, the undersigned cannot discover that the roofing in practical use, comes up to the recommendations of its promoters, and in view of the fact that its use is new, only about two and a half years, and from the well known fact that the atmosphere does oxidize the compound, the undersigned are unwilling to advise the American Institute to give it the indorsement of a first premium; yet in viewing the great industry, perseverance and laudable ambition of the promoters of this roofing, to meet a great public want, would advise all the encouragement that justice to the Institute and a fair, impartial dealing with the whole public, that a premium of the third degree be awarded. Nothing in the whole range of contributions to the public wants is so difficult to supply as a plastic or flexible roofing, at a cheap rate. With a very few exceptions, all good buildings have been covered with tin, copper, slate or tile. All these will wear over ten years. Next in value and durability, is asphaltum, over saturated paper and covered with gravel, and judging from the experience of the past, the plastic slate is next, but this article has been only about two years before the public, and where its application has been in three coats on tin, it is found to be oxidized, and all its adhesive property destroyed, and to flake off in brittle friable particles. This is the case on a roof recommended as a sample roof by Vannorden & Co., foot of Nineteenth street, at Newell's saw mill. On one of the sheds, the roof looks well, but has not "turned into slate." Where the roof is applied in winter, the roof does not harden, and always where applied in thick coats, retains its soft pitchy character, except on the surface.

No. 254. (Smith & Speth.) A sample of bricks for the construction of chimneys. This is an admirable invention, a decided improvement in the forming of an ordinary flue. There is but one joint upon each layer of brick, while the next layer laps, making great security against fire, and a decided improvement in draft, by reason of the smooth inside and rounded substitute for corners. This invention will simplify the construction of chimneys, and without adding to the cost, will also lessen the size of the jamb and space in the room. It should have a premium awarded, to encourage its author.

No. 40, from Bishop Gutta Percha Co., large assortment of gutta percha articles, principally adapted to marine telegraphing, worthy of premium. It is a fact that no other known substance has been found as a substitute for use in forming submarine cables, and until the discovery of this curious substance by Dr. Montgomery in 1843, no submarine could have been worked. This simple fact is worthy of entry into the managers' report, if reference is made to gutta percha and the ocean telegraph. An American, Mr. C. F. Durant, of New Jersey, is the first man to record the fact of its adaptability for casing marine cables. (See his patent for dissolving gutta percha by use of chloroform, about 1846 or 1847.)

No. 1321. Eagle Slate Company, Eagle Roofing Slate. The specimens shown are of very good quality, and have the merit of being light and thin. Recommend third premium.

HORACE H. DAY,
M. S. KERRIGAN, } *Judgds.*
ADOLPH OTT,

## FIFTH GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department IV, Group 5, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the method used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

The whole number of Blackings is five, of boxes four, on exhibition. Of these 626, 281, 79, 18, and 951 are entered for competition. The article bearing the number 626, Thomas H. Spencer, inventor, is decided to be the best on exhibition. It must also be stated, incidentally, that this is beter than any of its class known to the judges. Its merits are, it contains the smallest amount of free sulphuric acid, and gives a fine polish, but is inferior in the latter quality to the Central Park blacking, No. 281. The latter contains more acid.

N. B. Each of these blackings contains free sulphuric acid, except the liquid blacking; but the latter contains too much acetic acid. Of the boxed, for competition, Doughty's blacking box and cartridge, No. 18, appears the most practical.

Respectfully,

F. F. ENGLEHART, } *Judges*
E. F. CHANDLER.

## SIXTH GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department IV, Group 6, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish them evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

No. 294. From French Chemical works. We have given these samples of extracts, or more properly speaking, imitations of flavors of raspberry, strawberry, pine apple, &c., a thorough trial; having prepared some lozenges and bon-bons with these extracts, we find the same superior to any we have seen or used during a twenty years experience, and we recommend them as a first class article.

No. 144. Mr. John J. Squire exhibits a most excellent fruit jar, for preserved fruits and vegetables, which he claims is better adapted than any other jar for family use.

We sustain his claims fully in this respect, as we find his jar requires but a very slight knowledge of preserving fruits, and after it is sufficiently heated, it is easily corked—the most difficult part of the fruit preserving process.

For preserving berries and such kind of fruit and vegetables as contain less acid and more sugar than others, his jar is the best now in use, since the fruits can be preserved in this jar without sugar, and will retain their natural flavor for some time. We therefore recommend it as a first class and ingenious article.

No. 967. C. C. Williams & Co., exhibit seventy-five jars of fruits which are well preserved, so far as we can judge.

The pears and peaches are excellent. They use three kinds of preserve jars; but we cannot discover anything novel in the preserves, since other preserving establishments possess equally as good. As they are the only exhibitors and claimants, we refer the decision of thier claim to the honorable board of managers.

No. 985. Cape, Culver & Co. We have examined the Manhattan hams and breakfast bacon, and we find them both excellent articles.

No. 340. Taylor & Young. We have tested the "Pioneer Yeast Powder," and find it composed of superior ingredients—most reliable, more thoroughly mixed, more delicate, and in fact superior to anything of the kind heretofore known. It is well adapted for breakfast and tea biscuit—light doughs, such as pot pies, &c., but not so well for bread, which being generally made in large loaves, a large amount of these kind of chemicals injure the flavor of the bread during the process of fermentation.

No. 282. Phœnix Mustard Co. Sample No. 2 has the mildest and most agreeable flavor.

No. 237. Charles L. Stickney. This sample of mustard is fair.

No. 585. James Morton. With regard to this case of samples of biscuits, the exhibitor has not only displayed superior workmanship in crackers of every description, but he has proved at the same time, that he possesses a thorough knowledge of his business, by the excellent materials he has used in manufacturing the same. We can find nothing superior to his biscuits elsewhere.

No. 137. L. H. Boole. Preserved compressed eggs are an article which can be used for a variety of purposes where it is impossible to have eggs in their natural state.

We have not chemically analyzed this article. An egg without the white loses its essential strength just as much as an orange or lemon when deprived of its juice. This is not in its strictest sense a preserved egg; it is only the yolk pressed into a cake and dried.

No. 211. Peter Cooper exhibits gelatine, a well known article. After a thorough test of the same we find that it has been brought to the highest state of perfection, and is certainly equal, if not superior to any of the foreign gelatines.

SAMUEL H. MAYNARD,
ERNEST GREENFIELD, } *Judges.*
GEO. H. BEYER.

## SEVENTH GROUP.

*To the Board of Managers:*

Gentlemen—The undersigned judges in Department IV, Group 7, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish some evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised, in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

The whole number of articles on exhibition is thirteen.

No. 800. By P. P. Meyer, specimens of spinning for chemical apparatus. The work is excellent; we have not seen it surpassed.

No. 1088. Colwell, Shaw & Willard, specimens of burning of tin and lead. A very important process for soldering tin and lead without the use of the usual solder. The work is very handsomely and very perfectly executed.

No. 857. Filtering Apparatus, by John P. Gruber. An ingenious application of atmospheric pressure, by which the filtering of liquids, which under ordinarv circumstances filter very slowly, is greatly hastened.

C. F. CHANDLER,
HENRY DUNCAN,
THOS. EGLESTON, JR.,
ARTHUR MEAD EDWARDS.
} *Judges.*

## Department V.

### FIRST GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department V, Group 1, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised, in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles in the same class are given in their relative order of merit, together with a brief summary of such goints of excellence in each as are deemed worthy of special notice.

The class under examination exhibits satisfactory evidence of gradual improvement in this important branch of the mechanic arts.

It is with much gratification we are enabled to call the attention of the board of managers to such merits of excellence in the machines examined, embraced in this report, as have come under our notice.

The class includes steam and air engines, steam generators, and apparatus incidental thereto, and connected therewith, and turbine water wheels.

### STATIONARY NON-CONDENSING ENGINES.

The first in order of merit, is Wright's horizontal engine, with variable cut-off and independent exhaust, No. 982, constructed by the Washington Iron Works, Newburgh, N. Y.

This engine combines in its general design, superior workmanship and excellence developed in modern construction of these machines, and its special advantages are comprised in the arrangement and construction of its valves and valve gear, connected with, and controlled by the governor; its durability, simplicity and certain rapid and efficient action in regulating the admission of steam necessary to perform the work required.

The important parts of the valve gear being exposed and readily accessible for attendance and repairs, with little liability to derangement, and the addition of separate independent exhaust valves, so arranged that the pressure upon them diminishes with the expansion of the steam in the cylinder during the stroke, and balanced poppet main steam valves placed at the ends of the cylinder.

Babcock & Wilcox's Engine, No. 723, is a horizontal non-condensing, with slide valves and independent slide cut-off, actuated by the piston of a small steam cylinder upon the back of the main steam slide, the slide valve of which is controlled by the governor. This engine combines many good qualities in design and workmanship; the expansion apparatus is enclosed within the steam chest of the main steam slide. And while we consider this engine highly creditable in its design, in the arrangement of its several parts and performance, it does not, in our opinion, combine all the merits of excellence embraced in the Wright engine before explained.

Root's Trunk Engine, No. 719, is non-condensing; a very compact machine and well adapted for use where economy of space is required. The work is creditably executed, the details are well carried out, and reflects much credit upon the skill and mechaniical resource of its projector. The points of excellence are: 1. Economy of space. 2. Ready access to all its parts. 3. Combines the feature not possessed by any other trunk engine in its proportionate length of connecting rod, and in the protection of the trunk from radiation by exposure to the atmosphere, admissible in this form of engine, but which is not fully carried out in the engine on exhibition.

Oscillating Non-condensing Stationary Engine, No. 418, W. E. Bird, is a good design as relates to its arrangement of operating the slide valve, the valve face being stationary, and the joint readily kept tight at the point of contact with the trunnions.

## ENGINES DESIGNED FOR AND ESPECIALLY ADAPTED TO MARINE PURPOSES.

The only engine presented, brought to our notice, is Allen's propellor steam engine, No. 123. It is a pendulum engine, very compact, and simple in its construction and design.

The surface condenser attached, with Allen's compressed wood packing, is one of the best (perhaps the best) ever used, the packing being readily renewed, is tight, while it allows for the elongation by expansion of the condenser tubes.

The engine exhibits a thorough and well studied design, having for its object the most simple arrangement, combining the least number of parts, to secure cheapness, strength and efficiency, and exhibits a thorough appreciation on the part of its designer of the problem connected with the production of the best engines adapted to driving the screw.

We are not, however, prepared to say this engine combines such superior merit as to recommend its use (in our judgment) in preference to the best design of screw engines.

## STEAM BOILERS.

Gerner's Steam Boiler, Erie Basin Works, No. 932, possesses the novel feature of an interior steam reservoir, surrounded with water, and connected with the steam dome, has a large ratio of effective heating surface; by its arrangement proper circulation of the water is secured; it is an economical steam generator of the strongest form of construction, and is accessible for cleaning and repairs to such of its parts as are most liable to deterioration and wear.

Root's Sectional Wrought Iron Safety Boiler, No. 720, is comprised of wrought iron tubes encased in brick work. The tubes are inclined and connected at the ends; the arrangement has large heating surface, readily repaired, and in our opinion a safe and economical generator of steam.

Davis' Safety Steam Superheating Boiler, No. 1183, is a simple, cylindrical, vertical tubular boiler, with cast iron spheres, located upon the top. When in use, these spheres are surrounded by the escaping products of combustion, by which the steam is superheated, the steam passing through the whole system of spheres; the arrangement for superheating being simple, and efficient for the purpose, and easily accessible for repairs.

Symmes & Hayes' Cone Boiler, No. 1529, possesses the feature of using cones in the fire chamber for increasing the heating surface. Pipes are inserted in the lower ends of the cones, passing out through the sides of the boiler, and again under the furnace in the lower water space.

The boiler is vertical and cylindrical in form, and an efficient steam generator, but the arrangement more or less liable to rapid deterioration.

### APPARATUS CONNECTED WITH STEAM ENGINES AND STEAM BOILERS.

Knowles' Boiler Feeder, No. 572, is a very efficient and valuable instrument for feeding and regulating the supply of water to steam boilers, is automatic, and an important adjunct to stationary steam boilers.

While we entertain an opinion, highly favorable to the value and great merit of this apparatus, and in thus expressing it, we are fully sensible of the objection urged to automatic apparatus, having for its object the all important question of the supply of water to steam boilers, involving as it does the serious and calamitous results in the event of failure.

We believe this apparatus the best heretofore brought to our notice, and highly meritorious in accomplishing the object for which it is designed.

Clark's Steam Fire Regulator, No. 1196, is a valuable and efficient instrument for accomplishing the object for which it is designed, and highly meritorious.

### CALORIC ENGINES.

Wilcox & Co.'s, No. 1291, was the only caloric engine brought to our notice.

This engine is single acting, and receives the air through the furnace chamber before it enters the cylinder—is novel in this particular arrangement. The engine is well adapted for the production of limited power, is simple and easily taken care of.

### ROTARY ENGINES.

Ortlieb's Engine, No. 954, is of the type known as the rotary, has one piston, and three sliding pieces so arranged that the steam after performing its work within an inner chamber against the rotating piston, passes to the periphery or outer chamber, where it is expanded, and exerts the pressure due to its volume further upon the piston.

The object of the combination of its parts, is to produce a balance of pressure upon all the working parts to prevent unequal wear and lateral motion.

The arrangement for keeping the parts tight, is by means of balanced friction plates.

The engine is constructed with the view to prevent unequal wear, and remain tight under working pressures, and is the best form of rotary engine known to us.

But two articles embraced in the list remains to be disposed of. These are turbine water wheels, Nos. 1213 and 231.

We should have been gratified to have embraced these wheels in the foregoing report, but could learn nothing whatever of their principles of construction or action.

All of which is respectfully submitted.

WM. W. W. WOOD,
W. W. VANDERBILT, } *Judges.*
JAS. F. LEVINESS,*

No. 1292, Wilcox Portable Steam Engine and Boiler, Wilcox Steam Engine Company, Providence, R. I., is a very fine specimen of a small portable steam engine and boiler. The engine commends itself for its nice workmanship and completeness, while the boiler is well worthy of notice as a good sample of cast iron boiler, made in sections well fitted up and mounted.

For parties wishing small power and a very safe, reliable boiler, or for transportation in distant parts of the country where pieces of small weight is an object, this combination is well worthy of a first premium.

ISAAC V. HOLMES,
WM. C. SELDEN, } *Judges.*
CHAS. E. EMERY,

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* **Approved, with the exception of No. 982.**

## SECOND GROUP.

### REPORT OF THE JUDGES UPON THE TRIAL OF PUMPS.

The undersigned, judges of Group 2 in the 5th Department, respectfully submit the following report:

### First Division—Pumps Practically Tested

| | | |
|---|---|---|
| No. 780. | Steam Pump, | James Clayton, Brooklyn, N. Y. |
| 661. | do | Knowles & Sibley, Warren, Mass. |
| 668. | do | Woodward Steam Pump Company, New York city. |
| 929. | do | Campbell & Hardick Brothers, Brooklyn, N. Y. |
| 662. | Centrifugal Pump, | Turbinate Pump Company, New York city. |
| 669. | Steam Valveless Pump, | Chappell Manufacturing Co., New York city. |

To ascertain the comparative merits of the steam pumps, each pump was in turn placed over a large cistern from which it received water, which was first delivered into two measuring tanks, so arranged that one was being filled while the other was emptying into the cistern. Each pump was supplied with steam from the same boiler, and as far as possible, the same pipes were used in all cases.

First Trial.—To determine the relative economy of the pumps: The pump was put in regular operation, and the trial commenced when the water fell in the boiler by evaporation to a mark on the boiler gauge, and it ended when the water had fallen to a similar mark placed six inches below. The steam gauge attached to the boiler showed sixty pounds, at the commencement of trial, and the fire was regulated so as to keep it at the same pressure while it continued. In this way the quantity of steam used by each pump was made practically the same.

Attached to the discharge-chamber was a pressure gauge; and by means of a stop-valve the pump delivered its water, against a pressure of sixty pounds per square inch, into the measuring tanks.

During this trial the power exerted by the engine was measured by the indicator, while the cost of the power was estimated from the quantity of water evaporated in the boiler; and the duty of the pump by the number of gallons delivered into the tanks.

Second Trial.—To determine the maximum rate of discharge, with a pressure of sixty pounds on the boiler, and delivery against a pressure of sixty pounds; the pump to exert its maximum capacity of discharge.

Third Trial.—To determine the minimum rate of discharge with a pressure of sixty pounds on the boiler. and delivery against a pressure of sixty pounds; the pump to show the slowest practical speed at which it can deliver water.

FOURTH TRIAL.—To ascertain the time required to show the pump valves: The trial commenced at a given signal, when the pump was delivering water under pressure; one man then stopped the pump, removed the bonnets, showed the valves, replaced the bonnets, and started the pump again. Time was noted as soon as the joints proved tight under pressure.

FIFTH TRIAL.—To show the condition of steam valves and pistons under the boiler pressure of sixty pounds, with the cylinder head removed.

The results of the five trials are condensed into the following tables:

| NAMES OF PUMPS. | Description of pumps. | Diameter of steam cylinders, in inches. | Diameter of water cylinders, in inches. | Length of stroke, in inches. | FIRST TEST.—ECONOMY. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Steam pressure, in pounds. | Water pressure, in pounds. | Total time of test, in minutes and seconds. m. s. | Total number of revolutions. | Double strokes per minute. | Piston speed, in feet per minute. | Horse-power. | Coal, in pounds, per horse-power per hour. | Water, in gallons, delivered by pump per minute. | Water, in gallons, delivered per horse-power per minute. | Total quantity of water, in cubic feet, delivered by pump, using same steam. | Percentage of calculated quantity of water delivered. |
| Niagara ...... | Direct. | 12 | 7.00 | 12.6 | 60 | 60 | 28–40 | 1367 | 47.68 | 96.63 | 12.16 | 8.744 | 181.65 | 14.19 | 694.32 | 96.0 |
| Knowles ...... | Direct. | 10 | 6.00 | 11.3 | 60 | 60 | 26–20 | 1555 | 59.06 | 111.23 | 11.71 | 9.884 | 148.47 | 12.67 | 521.23 | 93.6 |
| Woodward .... | Crank. | 12 | 7.00 | 6.0 | 60 | 60 | 23–10 | 2222 | 95.90 | 95.90 | 13.41 | 9.807 | 166.27 | 12.39 | 513.59 | 88.5 |
| Niagara ....... | Crank. | 9 | 5.00 | 7.0 | 60 | 60 | 39–01 | 3693 | 94.65 | 111.26 | 9.65 | 8.096 | 104.40 | 10.82 | 543.17 | 95.4 |
| Clayton ....... | Crank. | 9 | 5.06 | 7.5 | 60 | 60 | 36–40 | 3245 | 88.52 | 110.64 | 10.38 | 8.012 | 54.37 | 5.24 | 265.78 | 49.0 |

| NAMES OF PUMPS. | Description of pumps. | Diameter of steam cylinders, in inches. | Diameter of water cylinders, in inches | Length of stroke, in inches. | SECOND TEST. MAXIMUM CAPACITY. | | | | THIRD TEST. MINIMUM CAPACITY. | | FOURTH TEST. VALVES SHOWN. | FIFTH TEST. CONDITION OF VALVES, &c. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Steam pressure. | Double strokes per minute. | Water, in gallons, delivered per pump per minute. | Percentage of calculated quantity of water delivered | Double strokes per minute. | Water, in gallons, delivered per minute. | Time, in minutes and seconds, required to show valves of pumps. m. s. | Pistons. | Valves. |
| Niagara ....... | Direct ... | 12 | 7.00 | 12.6 | 60 .... | 81.5 | 279.9 | 86.5 | .33 | .5 | 0–42 | Leaked a little. | Leaky. |
| Knowles ...... | Direct ... | 10 | 6.00 | 11.3 | 60 to 50 | 87.5 | 237.2 | 98.0 | 2.5 | 3.14 | 13–45 | Very leaky. | Tight. |
| Woodward .... | Crank ... | 12 | 7.00 | 6.0 | 60 to 54 | 125.0 | 181.5 | 82.3 | 24.5 | 39.78 | 21–25 | Leaky. | Tight. |
| Niagara ....... | Crank ... | 9 | 5.00 | 7.0 | 60 to 50 | 141.5 | 139.3 | 85.1 | 32.5 | 35.74 | 0–43 | Leaky. | Tight. |
| Clayton....... | Crank ... | 9 | 5.06 | 7.5 | 60 .... | 141.0 | 65.34 | 36.7 | 54.2 | 17.02 | 3–33 | Leaked a little. | Tight. |

### ANALYSIS OF TRIALS.

As it is desirable, in some cases, to use a steam pump as a steam engine, the committee arranged and examined the pumps in two sections—(1) simple steam pumps without cranks, and (2) combined steam pumps and engines with cranks.

First section: Niagara, direct acting pump; Knowles direct acting pump.

Second section: Woodward crank pump: Clayton crank pump; Niagara crank pump.

*First Section.*—Comparing the result of the Niagara and Knowles pumps, we find that the latter delivered the largest percentage of the calculated quantity (average of the results of the first and second trials); but the Niagara discharged the greatest number of gallons per horse power per minute.

On the trial for economy, both using the same quantity of steam, and at the same pressure, the Niagara pump delivered 694 cubic feet, and the Knowles delivered 521, against a pressure equal to that in the boiler.

Comparing pumps of the same size by these makers, the maximum and minimum rates of discharge would undoubtedly be substantially the same.

The Niagara was stopped, its pump valves shown, and the pump started again in forty-two seconds. The Knowles required for the same, thirteen minutes and forty-five seconds. This would be an important difference on shipboard, when, in time of danger, pump valves are liable to choke every few minutes.

The Knowles pump is tasty in appearance, and excellent in design. The workmanship is uniformly superior, and reflects great credit on the manufacturers. The Niagara shows no attempt at finish or external workmanship; but from the given results we judge that the essential parts are well fitted. They therefore decide for the first section: First premium, the Niagara direct acting pump, made by Campbell & Hardick Brothers, Brooklyn, L. I. Second premium, Knowles direct acting pump, built by Knowles & Sibley, Warren, Mass.

*Second Section.*—In regard to the combined steam pumps and engines, the foregoing tables show that the Clayton was slightly the most economical in the cost of horse-power, and second best in the time required to show its valves. But this pump did not deliver one-half as much water as the other pumps using the same pressure of steam. The Woodward pump delivered more water per horse-power than the Niagara crank; but the cost of each horse-power was greater, so that the Niagara gave the best economical results. The Woodward falls behind slightly, too, in the percentage delivered of the pump piston development. These differences are, however, so small that we may consider that pumps of equal size would be substantially equal in economy and rates of discharge.

In the trial to ascertain the time required to show the pump valves, the Niagara was running again in forty-three seconds, while the Woodward was twenty-one minutes and twenty-five seconds in accomplishing the same object. The Niagara (crank) has, in addition, arrangements for disconnecting at will either the steam or pump pistons; so that the machine may be used either as a steam pump, a power pump, or a steam engine. This is an important feature, which is entirely lacking in the other pumps on exhibition. The Woodward has been long and favorably known. It is strong, durable and reliable; but we consider that the Niagara (crank) its equal in these respects; and, in addition, possesses the advantages above mentioned. We, therefore, decide for the second section: First premium, Niagara crank pump, manufactured by Campbell & Hardick Brothers, Brooklyn, L. I.; second premium, Woodward crank pump, made by the Woodward Steam Pump Company, New York city. In addition to the foregoing awards, we would recommend that there be given a first premium to Knowles & Sibley, and a second premium to the Woodward Steam Pump Company, for superior excellence in the workmanship of the articles exhibited by them in this group.

### REMARKS.

A general impression is believed to exist that to make a reliable steam pump, the reciprocating motion must be changed into a rotary, by means of a crank. The early direct acting pumps, which actuated the steam valve directly by tappets, could not successfully compete with crank pumps. But these trials prove conclusively to us that for simple pumping purposes the improved direct acting pumps on exhibition are superior to any crank pump. The improvement which has made these pumps a success consists in actuating the main steam valve by a secondary movement, derived from a special steam piston.

Comparing pumps on the two systems, having the same sized steam and water cylinders, we find that the direct acting pumps have the following advantages over crank pumps:

1st. The direct acting pump occupies less space.

2d. The price is fully twenty per cent less.

3d. Being of longer stroke, it does not change the direction of the water so often as to develop a given capacity.

4th. It imparts a more equal velocity to the water.

5th. It produces less jar when in operation at high speeds under pressure.

6th. It can deliver a greater amount of water in a given time.

7th. It may be run as slow as desirable without fear of stopping.

8th. It will start at any part of the stroke, even when the steam and exhaust pipes are full of condensed water, by simply opening the steam valve; and will run under water in case of emergency.

No. 969. Steam Valveless Pump. (Chappell Manufacturing Co., 99 Bank street, New York.) A two-inch pump, with fifty pounds pressure of steam in the boiler, delivered one hundred and fifty gallons of water per minute against a head of six feet. The quantity of steam used proved that this pump is equal in economy to others of the same class, all of which are considerably inferior in this respect to the ordinary steam pump. The Chappell pump is constructed with a new feature, whereby the current of steam may be changed, and the suction pipe quickly cleaned when it becomes choked. This is a valuable improvement. This pump is especially useful on shipboard to clear the bilges, and may be employed as a fire pump in case of an emergency. We consider it, with its improvements, the best pump of its kind in the market, and recommend for it a first premium.

No. 662. Gericke's Centrifugal Pump. (Turbinate Pump Co., 112 Wall street, New York.) The power was measured by a dynamometer, and the water by the tanks before described. A five-inch pump required 736 revolutions and two and one-tenth horse power to deliver 343 gallons of water per minute against a head of six feet.

This trial showed conclusively that a given quantity of water may be lifted a short distance with this pump much more economically than with an ordinary steam pump.

The trial under pressure, obtained by throttling the discharge, did not give as good results as the steam pump.

This pump is very efficient for drainage and circulating purposes, where large masses of water are to be moved. It is simple in construction, with no parts liable to wear or get out of order; and we recommend it for a first premium.

The foregoing comprises all of the cases in which a practical trial was made of the articles exhibited. The results show that such a trial should be made of all machinery entered for competition. The mere professional opinion of a judge is not conclusive to others, as every man's judgment is necessarily influenced by the comparatively narrow field of his own experience. Nothing can be satisfactory and conclusive but the result of practical experiments; these are convincing to all.

As these trials are the first ever made under the auspices of the American Institute, we desire to call attention to the general plan pursued.

Every person who buys a steam engine of any kind desires to get his work done for the least possible cost; therefore, with all reliable machinery, the question is to know the cost of useful work in pounds of coal. All experiments which do not ascertain this fact are worthless. Experience has proven that for short experiments the best way to ascertain the cost is to measure the quantity of water fed into the boiler in a given time to maintain the water level. This eliminates all errors due to unequal firing, and the number of pounds of coal of average quantity required to evaporate the feed-water is easily estimated.

Next, the useful work must be in some way measured. This is shown in a pump by the quantity of water discharged against pressure. In an ordinary steam engine it should be measured by a dynamometer upon the shafting, as the net power can only be calculated approximately from indicator diagrams. In the pump trials the indicator was used in connection with the records of water evaporated by boiler and water discharged by the pump.

The table shows, therefore, the cost of the indicated horse-power and of the useful work; it also indicates the particular fault of each pump.

For example, the engine with the tightest piston gives the most economical result by the indicator, and the worst result of all in useful work; showing that the power was absorbed in friction and in passing the water back and forth by a leaky pump piston. Another pump fell behind in the water delivered per horse-power, but gained in economy of steam sufficient to overbalance the loss of friction. Other illustrations might be cited, but the foregoing are sufficient to show the value of practical trials.

### Second Division—Articles Examined but not Tested.

No. 661. Knowles' Steam Hydraulic Pump. (Knowles & Sibley, Warren, Mass.) We would speak in the highest terms of this arrangement, both as regards the design and application of steam direct to hydraulic work, and also of the workmanship, which is of a very excellent character; and looking at it in relation to the economical working of hydraulic power, we consider it worthy of a first premium.

No. 929. Steam Air Pump. (Campbell & Hardick Brothers, Brooklyn, L. I.) In the application of steam to pumping air the combination by which a small stream of water is made to pass through the air cylinder and valve chest, so as to water-pack the valves, is worthy of notice, and we would recommend for this pump a second premium.

No. 787. Rotary steam and Belt Pump. (Metropolitan Engine Company, New York.) The committee were much disappointed in not being able to have a practical test of this pump in competition with the reciprocating pumps. They therefore have to make their decision as to its merits from examination and not from practical tests, which would have been much more satisfactory.

The arrangement shows much ingenuity in the inventor, yet for a pump is quite complicated with packings and wearing pieces, which we think would be a serious objection when used with fluids charged with dirt or grit.

In the application of the system as a steam cylinder, we see points of excellence which meets our approval, and the committee would therefore recommend it as an article worthy of your notice, and deserving a second premium.

N. 946. Rotary Steam Pump. (Henry C. Dart & Co., 5½ Pine street, New York.) The same remarks will apply, as regards the testing of this pump as was made by the committee in their report on No. 787. They would only add they feel very sorry such an opportunity has been lost, of comparing the relative economy of the rotary with the reciprocating system.

As far as could be judged by examination, the committee were very favorably impressed with the arrangement of the pump as combining great simplicity with freedom from friction by the pistons, and when arranged as a power pump to be driven by belt, would consider it as well worthy of your notice, and deserving of a second premium.

No. 858. Ale Apparatus and Water Works. (John P. Gruber, 182 Chatham square.) The committee are very strongly impressed with the value and importance of this arrangement. The use of compressed air in the place of the vacuum produced by a pump to raise the ale from the keg or barrel, has two important advantages. First, the reservoir of air keeps the fluid ever ready to flow when wanted; and second, the pressure of the air on the surface of the ale keeps the gases confined, and the ale fresh as long as any remains in the barrel. It commends itself also for simplicity, as one air pump and tank will force the fluid from as many different barrels as may be required.

As a means of supplying water to houses from wells and ponds, giving a steady supply on all the floors, without the necessity of having large tanks placed near the roofs, into which the water must first be pumped, is a great advantage, doing away with the liability of damage from leakage from such tanks, as well as relief from supporting the weight. We would, therefore, earnestly recommend that a first premium be awarded for these apparatus.

No. 1196. Hand Power and Force Pumps. (Rumsey & Co., Seneca Falls, N. Y.) A fine display of well made and proportioned pumps showing superior workmanship, well worthy of your notice, and deserving of a second premium.

No. 157. Four Pull Ale Pump. (James M. Whitfield & Son, 262 Water street, New York.) A complete and highly finished piece of bar furniture, fitted with everything necessary for delivering ale. Worthy of notice, and deserving of a second premium.

No. 1226. Drinking Fountain for Man and Beast. (D. D. Nash, 58 Hoyt street, Brooklyn, L. I.) In this arrangement of a public drinking fountain, the inventor has in a very complete manner so arranged the supply of water for the use of man and the various animals, that each can, without interference with each other, receive the benefit of the water.

The structure is strong and durable, and a grand improvement on the old system of unsightly wooden troughs, which at the present time disfigure the curbstones of the streets of the city. Therefore, the committee would, in consideration of its utility as well as design, recommend a first premium.

No. 300. West's Anti-freezing Hand Pump. (J. D. West, 40 Cortland street.) This, upon examination, is found to contain many points of excellence which go to make a good reliable pump. In construction it is simple, also easily taken apart for examination and repairs, one piece of leather forming all the valves. The secondary foot valve is an important feature, giving great steadiness of holding the water when lifting from great depths. In the well or farm pump we would call attention to the arrangement by which the water of its own gravity settles back to the barrel, and to the air chamber surrounding the barrel to protect it from cold, so that the pump is never, in the coldest weather, disabled by frost, a very important consideration in the Northern States.

Taking all into consideration, the committee are of opinion that it is the best pump of its kind, and which they find is sustained by the testimony of parties who have used them. They would therefore, recommend a first premium.

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|---|---|
| ISAAC V. HOLMES,<br>WM. C. SELDEN,<br>CHAS. E. EMERY, | *Judges.* |

## THIRD GROUP.

*To the Board of Managers:*

Gentlemen—The undersigned, judges in Department V, Group 3, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the machines entered for competition, great scrutiny has been exercised, in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

No. 123. Taper Lathe. (Pratt, Whitney & Co.) Its merits are simplicity, positive action, power of accurate adjustment of the taper attachment, and method of constructing the tool post, so that it can easily be raised or lowered, and still be firm under the action of the tool. The taper attachment is most especially meritorious. The lathe also, considered without this, is a first class machine in every respect. We therefore respectfully recommend it to honors of the first class.

No. 392. Engine Lathe, small size. (Chelsea Machine Works.) Its merits are: 1. Its general design, sound material, and this material varied in kind, so that it can best resist the kind of wear to which the several parts are exposed in use. 2. That it is made upon the system of duplication, or gauge work. 3. The provisions which have been made in every possible way to compensate for wear by adjustments. 4. The method of confining and adjusting the table of the tool-rest on the slide. 5. The frictional operations of the slide-rest to secure prompt action of the tool. 6. The method of finishing those parts most exposed to wear, by scraping, and not by filing with emery or emery cloth.

This machine shows a great advance in that class of tools, which have now become so necessary in producing the gauges, taps and other instruments used in all classes of machine manufacture where duplication is an element; and the more of such machines we have the more rapid will be our progress in exactness of execution and economy of production. We therefore earnestly recommend that the highest honors of the Institute be awarded to it.

No. 539. Engine Lathe, cross feed. (Hall, Washburn & Co.) Its merits consist in the simplicity of the cross-feed device, the great excellence of workmanship in all its parts, and the material being good and sound. We recommend it to your consideration for first class honors.

No. 873. Engine Lathe. (H. D. Stover.) This lathe is made of good sound castings, is exceedingly well proportioned and well made throughout; good square work and finish, and a credit to the exhibitor.

No. 356. Foot Lathe. (Adam Stewart.) Its merits are, excellent material, good design and accurate, first class workmanship and high finish. It is, therefore, respectfully recommended to first class honors.

No. 537. Bolt and Screw Cutting Machine. (New York Steam Engine Company.) Is a first class tool in all respects, and entitled to the highest consideration.

No. 874. Planer. (H. D. Stover.) Its merits are, good design, good sound material, and good workmanship and finish in all its details. It works with less shock on short work than is usual with machines of its size and weight. A first class machine and entited to first class honors.

No. 542. Crank Planer. (New York Steam Engine Company.) The only one of the kind exhibited. But we consider it entitled only to such consideration as would be awarded to fair class tools, such as are found on sale. Its peculiar feature is the quick back feed.

No. 541. Shaping Machine, large. (New York Steam Engine Company.) It is a remarkably well made tool. Its design, material and workmanship, and its range of work, entitle it to honors of first class.

No. 872. Shaping Machine, small. (H. D. Stover.) Its material and design are excellent, and its workmanship and finish first class, and is every way worthy of high consideration as a machine for making work for the duplicate or interchangeable system, as well as the ordinary work of the machinist. We respectfully recommend it to honors of the first class.

No. 841. Drop Hammer. (Golding, Cheeny & Co.) Its merits are, that it dispenses with the gearing attached to the rolls raising the hammer, as usually constructed. Its workmanship is good, and the material is well disposed of to make it capable of resisting the concussions to which this class of machines is exposed. We cordially commend it to the highest honors of the Institute.

No. 1182. Drop Hammer. (N. C. Stiles.) The method of raising the hammer by an endless belt is entirely novel. The theoretical objections to which (for heavy work especially) can only be set aside by experience, which the limited time of an exhibition will not give. It is decided to be worthy of high consideration by the Institute.

No. 100. Compressed Air Forging Hammer. (Thomas Prosser & Son.) This hammer is a machine of great merit. The construction is highly ingenious. The material and workmanship strictly first class. It delivers a firm, hard blow. It can be operated with great rapidity, and it instantly lifts from the iron, so that it is not cooled in hammering. It is under perfect control, so that a large range of work can be executed by it.

Having seen this hammer in actual working operation, we most earnestly recommend it to the first class of honors of the Institute.

No. 970. Air Spring Hammer. (Charles Merrill & Sons.) This hammer combines great simplicity and strength; utilizing the power generated by the upward stroke, and increasing the force of the downward blow; the working parts are durable, and not liable to get out of repair. The application of the device is entirely novel, and we mark our appreciation of the merits of the machine by earnestly recommending it to receive the first class honors of the Institute. This hammer has also been inspected in actual work, with the most satisfactory evidence of its effectiveness and manageability.

No. 172. Steam Forging Hammer. (Richard Dudgeon.) The work and design are both good, embodying simplicity and strength.

The peculiar feature is the octagonal piston rod, which gives great force to the blow, and keeps the hammer true to its work without guides. It is easily controlled, and gives variable blows, adapting it to different classes of forging. We recommend it to the consideration of the Institute for its honors.

No. 1180. Power Press. (N. C. Stiles.) Its merits are, good design for strength, good material, excellent workmanship; device for setting the dies with great facility, and without injury, and means of regulating the throw of the press to the nicest possible point, thus saving the wearing of the dies.

This machine is strictly first class in every particular, and we therefore earnestly recommend it for the first class honors of the Institute.

No. 235. Power Press. (E. Brown.) Its merits are, good design, good material and excellent workmanship. This machine is for punching and drawing up that class of work used for small covers, as can tops, cartridge cases and powder flask nozzles. It performs these two operations at each throw of the press, with the greatest precision and rapidity. The good qualities of this machine recommend it to the highest honors of the Institute.

No. 1181. Foot Punch Press. (N. C. Stiles.) This is decided to be a first class tool and worthy of notice.

No. 236. Foot Punch Press. (E. Brown.) This is decided to be a first class tool of its kind and worthy of notice.

No. 336. Hydraulic Spring Tester. (C. Graham.) Its merits are, good design and workmanship, good material and the ease with which springs of great power can be tested and the accuracy of their tension registered. We, therefore, commend it to first class honors.

No. 131. Blacksmith's Forge and Tuyere. (James Paterson.) Its merits are: 1. Good design and material. 2. Allowing the air blast to reach all parts liable to burn out, keeping them cool and heating the air as is comes to the fire. 3. The conical tuyere and its seat, which, by a simple lever, allows the ashes to fall out of the way. 4. The ease with which the fire is cleared of cinders.

We heartily indorse this as the best forge and tuyere with which we are acquainted, and recommend it to the honors of the Institute.

No. 1216. Planer and Lathe Tool Holder. (Cooper & Philips.) Its merits are, simplicity of construction; a firm grip on the tool, so that it will not chatter in use; duplication in manufacture, so that worn or broken parts can be replaced; in thread cutting for taps, the angle once made does not vary till the tool is used up; and saving in steel and labor in forging. We commend this device to first class honors, as being one of the most important in the economy of the machine shop, and a helper in more perfect work.

No. 1014. Tool Holder. (T. L. Webster.) These tool holders are adapted to planing surfaces on the under edge, such as the grooves in planing machine tables, and for cutting slots, as long key seats in cranks, &c. The object is to prevent the drag of the cutting point on the back motion. These devices effect this very simply and surely. We therefore commend first class honors.

No. 74. Tool for Cutting off and Threading Pipe. (Webster & Co.) Its merits consist in strength and simplicity, and provision for easily replacing broken cutters. We commend it as a good tool.

No. 868. Drill Chuck. (G. W. Harris.) This chuck is less liable to get out of order, and is more solid than other chucks of this same general class. The tightening device also is superior, on account of its greater bearing on the movable jaws. We, therefore, commend it to favorable consideration.

No. 287. Valve Refitting Machine. (C. F. Hall & Son.) Its merits are, simplicity of construction, and truth of action, allowing valves and seats to be refitted with entire accuracy, and with little labor. We highly recommend this machine.

No. 590. Compound Lever Cut Nippers. (Hall & Gifford.) It is an exceedingly well made tool, and of good material, and its lever arrangement gives great power, and enables it to cut much larger wire without risk of breakage than the cut nipper of usual construction. It is manufactured upon the system of duplication, which allows the replacing of any parts that may break. We commend it as an improvement of merit, and a first class tool.

No. 337. Boilermakers' Tools. (Thomas Prosser & Son.) Its merits are the completeness of the collection, which comprises cutters, reamers, countersinks, and swedges for expanding the tubes; scrapers, both spring and spiral, and brushes for cleaning boiler tubes.

We notice, among other excellencies, the swedging tool (a most efficient one), the expanding segments of which are left on their surfaces as they came from the forging hammer, and which, without either planing or filing, exhibit truth of surface both in their radial sides and the arcs of the circles.

The workmanship of the tools throughout is unexceptionable, and the material of the best grade, and we consider them in all respects the best for use that are made.

We, therefore, earnestly recommend them as worthy the highest class honors of the Institute.

WM. PRATT,
WM. C. SELDEN, } *Judges.*
J. CLEMENT,

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## FIFTH GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned, judges in Department V, Group 5, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

No. 20. Cotton Spinning Machine. (Fales, Jenks & Son.) Its merits are, good material and workmanship, a simple and effective apparatus for raising and lowering the ring bar, and an improved construction of top rolls. This machine is such as is manufactured by the makers for first class manufactories, and was not specially made for exhibition, except so far as to make it short on account of transportation and limited room to exhibit. Your committee would specially commend this machine to receive the first honors of the Institute.

No. 224. Self Stripping Cards. (Gambril & Burgess.) This is decided to be entitled to the second rank in the class of awards. Your committee could only judge of this machine from inspection, as the cylinders were not clothed, or furnished with power. The machine is well made.

No. 225. Self Stripping Cotton Cards. (George Wellman.) A simple automatic movement raises every other one of the series of top cards, strips it, and returns it to place; when, by an automatic reverse movement, the other alternate top cards are in like manner raised, stripped and returned to place.

The device is simple and effectual, and the machine is well made. We commend it to first honors.

No. 265. Linen Loom. (Whiteside Brothers.) We are of opinion that this loom is well made. Its motions for changing the warp are simple and positive; by a series of cams every variety of diaper work can be produced. This loom is an advance upon those heretofore made, and we therefore respectfully ask for an award of a class commensurate with its merits.

No. 574. Loom for Weaving Narrow Fabrics. (L. J. Knowles & Brother.) Its merits are: 1. Great compactness in design, and very great ingenuity in the various movements necessary to accomplish difficult results. 2. The movements are all positive. The devices for throwing up the warp to form the various surfaces and figures, for holding the warp tightly during the moment of passing the shuttle, and more tightly still at the point of beating up, the laying in of the filling in such a manner that a firm, smooth selvedge is necessarily produced, are among the most ingenious in the whole range of mechanism. And when the loom is seen in operation, weaving, at the same time, the narrowest tape, the stouter coach lace or trimmings, the elastic and non-elastic suspender webbing, it is a convincing proof of American mechanical skill, and perseverance in overcoming great difficulties. Any one who doubts has only to witness the operation of the old German tape loom, which, till within a recent period, was the only one used in this branch of manufacture. We cannot too highly commend this machine to your notice and consideration as entitled to the first honors of the Institute.

No. 575. Woolen Loom. (L. J. Knowles & Brother.) This loom is adapted to that class of goods where it is desirable to throw the coarser stock on the under side of the cloth and the finer upon the upper surface, or for weaving fabrics where colors alternate. The movements to produce this automatically and unerringly are beautiful specimens of ingenuity. The mechanism for changing the shuttles, the take up and let off motions of the loom are admirable. We highly commend this to your most favorable award.

No. 1054. Cotton Gin. (S. R. Parkhurst.) This gin is intended for the long staple cotton, and possesses features of great merit. We highly commend its general design and construction, its strength and compactness.

The feeding apparatus works most perfectly, and the machine is provided with adjustments to suit the work in hand. It has a condensing device attached, which delivers the cotton in a sliver convenient for handling.

We have never seen long staple cotton so thoroughly cleaned from the seed; or the fibre delivered so entirely free from injury by breakage. We have seen this machine also clean the short staple cotton, delivering the fibre in good state, and the seeds as perfectly cleansed as by the other gins made expressly for this staple. Its rate of work on short staple as compared with other gins, we have had no means of testing. But for the above considerations, we heartily recommend it to consideration for first class honors of the Institute.

No. 571. Cotton Picker, proper. (R. Kitson.) Its merits are, great firmness in its construction, a quality which cannot be too highly commended in machines of this class; excellence of workmanship, which in this kind of machines is an absolute necessity; the self-acting break for compressing the lap, unaffected by atmospheric variations; friction gear for driving the calendar, to prevent breakings of gearing by accidents liable to occur in this class of machines more than any other department of cotton machinery.

This machine is a decided advance upon the best English machines of the same class, and we therefore recommend it to the first class of award.

No. 675. Mestizo Wool Picker and Burrer. (C. L. Goddard.) Its design is one of great compactness, its material and workmanship excellent.

The mechanical arrangement of the details of the component parts, and their execution show good conceptions and skill in carrying them out. The arrangement of the several parts in their relations to each other, and the offices they perform, show both effort and perseverance in the endeavor to obtain best results.

The work performed by the machine in repeated trials, on various kinds of stock, some of which was purposely selected on account of its unpromising qualities, and the excellent state in which it was delivered from the machine, impress us with its effectiveness in this primary step in manufacture. The oiling apparatus attachment, which oils the fibre evenly, is also to be especially noticed. After a careful examination, and repeated exhibitions, we cordially commend it to your consideration for first honors.

No. 933. Wool Picker and Burrer. (S. R. Parkhurst.) This is decided to be second in order of merit. In delivering the fibre in good condition under trial, working stocks of various grades, sometimes purposely selected for its poor quality, the performance of the above machine has been satisfactory.

The sliver apparatus in this machine, only facilitates the handling of the fibre, and most manufacturers would prefer it in bulk from the machine.

Your committee, looking at all points of design and construction, commend it to your notice as being in the second rank of classification.

No. 1052. Burring Heads, single and double. (C. L. Goddard.) Its merits are, the construction of the cylinders, with iron ribs placed spirally across the fibre of the wood, the spiral blades of the guards which were first used in this machine, and the solid rings placed between the burr circles. They, therefore, respectfully ask for them consideration as first class machines.

No. 1055. (S. R. Parkhurst.) Machines for the same purpose are placed second in classification; closely resembling in details No. 1052, they fail in being up to first class. But they are recommended to notice in the second rank.

No. 289. Samples of Card Clothing. (Sargent Card Clothing Company.) It combines great variety of grades, suitable for all classes of carding, with great precision in the setting of the card teeth, and uniformity of bend and surface of the same, and is made of good material. We earnestly commend this to the consideration of the Institute for first honors.

No. 290. Card Clothing Machines. (Sargent Card Clothing Company.) Its merits are excellence of material and workmanship, of which latter feature we cannot speak too highly; that it is made by the system of duplication or gauge work, which in a machine of this character is absolutely necessary; the simplification of it over machines hitherto in use; the improvement in the piercer and tooth sticker; the positive character of the feed motion, which is a grip, and not a feed by rolls, all of which enables the machine to run with double the rapidity of others, and with less liability to imperfections in work. We cannot too strongly commend this machine as an evidence of American skill and progress in a difficult branch of manufacture. We respectfully suggest that it receive the first class honors of the Institute.

No. 253. Wire Heddle Machine. (Brown & Ashworth.) Its merits are, good material and workmanship; great ingenuity in design and construction of the working parts, and the accuracy and completeness of its many movements, as also their positive character; the device for spreading the eye of the heddle from the inside, to prevent the catching fraying and breakage of the warp.

We wish to express our appreciation of the difficulties which have been so ingeniously overcome, by earnestly recommending that the highest honors of the Institute be awarded.

No. 848. Hat Lathe. (Isaiah Nutt.) Its merits are, that it allows the hat to be placed upon, and removed from the lathe with great facility, and insures the placing of the block at the exact point necessary to insure best results in oval work. A good and useful device.

No. 390. Toggle Link Cloth and Hay Press. (L. & P. K. Dederick.) This press contains a powerful pressing mechanism within narrow limits. Without having seen the large press in actual operation, we have a high opinion of its value from its great power, its compactness, and its strength and accessibility to working parts. We therefore recommend it to high consideration.

No. 726. Spoolers. (Hadley Company.) Its merits are, great nicety of operation, both in laying on the thread evenly and correctly, measuring and registering the number of yards wound. The machine is exceedingly well made, and we therefore strongly commend it for its ingenuity, the beauty of its work, and its thoroughness of construction, to high honors of the Institute.

No. 239. Cheneille Machines. (Bernstein Brothers.) Its merits are, the production of the goods known as cheneille cord or trimming with greater uniformity and rapidity than by the old process of manufacture. As an ingenious machine, we commend it to high consideration.

No. 1053. Loom Temples. (Henry Kayser.) In a collection of five of these temples one only is entered for competition. Its merits are, that by the inclination of a series of toothed wheels or disks, the cloth is kept continually stretched as it is woven. The great beauty of the invention is its external simplicity, its non-liability to derangement and its entire effectiveness. We commend it to your special consideration.

No. 1289. Carpet Printing Machine. (T. Crosley.) The mechanism, as fully shown in a working model, is very ingenious, and the parts, as they are successively brought into action, exhibit an entire adaptability to produce the desired results. The machine registers its work most perfectly, as shown by the samples of carpets exhibited.

Considering the great ingenuity of the machine, the perfection of its work, its economy over the methods now practiced, and its adaptability to other branches of a kindred nature, we earnestly recommend that it receive the first honors of the Institute.

WM. PRATT,
W. B. COGSWELL, } *Judges*
C. W. THARFE,

## SIXTH GROUP

*To the Board of Managers:*

Gentlemen—The undersigned, judges in Department V, Group 6, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges; articles of the same class are given in their relative order of merit, together with a brief summary of such points of excellence in each as are deemed worthy of special notice.

No. 81. Tobacco Cutter. (J. W. Crossley.) Its merits are, the method of operating the knife in such a manner as to secure a shearing as well as downward cut, enabling it to cut through large, hard masses of tobacco with the expenditure of little power, and leaving the tobacco in a better state; its facility of adjustment for various feeds, its freedom from clogging, and its strength. This machine is good, and is therefore recommended to your consideration.

No. 311. Hand Pegging Machine. (J. H. Brown.) Its merits are: It is useful to the workman of the small shop, for ordinary work. Its independent feed (not by the awl), enabling it to drive a larger peg than the hole pierced by the awl, producing firmer work. Its adjustable feed and margin, allowing the variety of production desirable for different classes of work. As a highly ingenious device, we recommend it to your consideration.

No. 648. Fire Brick. (B. Kreischer.) From every external appearance, and its structure when broken, it seems to be composed of the best materials known for this purpose. Its freedom from quartz in coarse pieces, is an important feature, because it renders a fire brick much less liable to crumble under long continued and high heat. As a good article of an important class in manufacture, it is recommended to your high consideration. It may be stated that two of the committee have used these fire brick and speak from experience as well as inspection.

No. 677. Brick Machines. (D. W. Seeley.) Its merits are, simplicity and strength, bringing it within moderate first cost, and low charges for repairs; the perfect preparation of material, and the delivery of the brick under pressure, securing uniformity of structure, well defined corners and true sides; its portability and facility of working at the locality of the material. This machine is therefore recommended to receive the honors of the Institute.

WM. PRATT,
LOUIS GUILLANDEU, } *Judges.*
J. CLEMENT,

## Department VI.

### FIRST GROUP.

The judges of Department VI, Group 1 of the fair of the American Institute, respectfully report that there were twenty-five articles to be examined, and that these articles have been examined as carefully as the limited time given to the jury would allow.

The jury in some cases do not find sufficient merit to justify them in recommending them to the notice of the managers of the fair, and in some cases the exhibitors have failed to make a sufficient statement of their uses and merits to enable the jury to form a correct judgment.

The following articles deserve special mention as being the best of the kind in the fair, and the jury do not know of others that are better:

No. 722. Locomotive Passenger Car. (Joseph Page Woodbury.) In this model the engine is placed directly on the forward truck, so that the engine and boiler move with the truck, thus doing away entirely with the flexible tubes which are used on ordinary locomotive passenger cars, and allowing of very great mobility in the action of the car. The jury had no means of making a practical test of this invention, since it is not in operation on the street railroads of New York, but they have no doubt that it will turn as short a corner as will be required in its adaptation to street railroads. The weight of the passengers will give sufficient amount of adhesion to allow it to run at any speed allowable within the corporation limits. The inventor claims freedom from noise, but the jury cannot judge of this from a model. The use of anthracite coal will give entire freedom from smoke.

No. 203. Jack Screws, four sizes. (Bridges & Lane.) In these screws the movement of a single nut operates two screws, so that all the advantages of the velocity of a double thread are gained, while the weight of which the screw is capable is twice what it would be if a double thread were used on a single column. The point which comes in contact with the material to be lifted is fixed to the screw so that the friction, instead of being applied to the cap, which is never well lubricated, is divided over the threads of the screw, which always are well oiled. The lever power is applied to the circumference of the nut, so that the useful effect of the whole lever is obtained, instead of a fractional part of it, as in the ordinary system.

No. 182. System of Bridge Building. (T. W. H. Moseley.) The model bore the severest test that the jury could apply to it, and finally broke from a defect in the construction of the model. The plan of the bridge, as explained by the exhibitors, is highly commendable.

No. 212. (Joseph Dixon.) Is an application of cast iron to building purposes, in which plates of cast iron are made to answer the purpose of stone. These plates are bound together by bolts and by joints of several kinds, as is shown on the model exhibited. The particular purpose for which the inventor proposes to adapt his invention, is for tunnels. This invention would greatly facilitate the construction of tunnels which pass through ground which will not stand. Some members of the jury are of the opinion that cast iron has been used for this purpose before, but as they are not able to refer to it, and as there is not sufficient time to look for it, they are of the opinion that Mr. Dixon should have the merit awarded to him, by the United States, of being the inventor.

THOMAS EGLESTON,
HAMILTON E. TOWLE, } *Judges.*
WARREN ROWELL,

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## SECOND GROUP.

*To the Board of Managers:*

Gentlemen—The undersigned, judges in Department VI, Group 2, report that they have examined the articles referred to them. In deciding upon the merits of the specimens, they have exercised great scrutiny in order to weigh impartially the evidences of utility found in each. The following is the result of their deliberations:

No. 192. Fancy Leather Goods. (James Eustace.) Their merits are, for the quality of stock used in the manufacture, fine workmanship and novelty in design.

No. 362. Improved Carriage Springs. (Palmer & Co.) These articles are of good workmanship, proportion in distribution of material to get effect, extra finish.

No. 592. Elastic Carriage Spring. (John R. Addin.) Best practical application of rubber to receive the concussion in passing over uneven surfaces. A valuable invention.

No. 762. Safety Bridle. (J. Bryant.) An efficient mode of controlling horses.

No. 468. Whips and Lashes. (George P. Overin & Co.) The quality of stock from which these whips are manufactured, as well as their superior workmanship, and artistic designs which is here produced, place them as superior to anything we have ever before inspected, and greatly advancing this important branch of manufacture.

No. 485. Arrangement for Detaching Run Away Horses. (C. Ducreux.) We have had an opportunity of examining and testing Mr. C. Ducreux's patent for instantaneously detaching horses from carriages, and have seen the design carried out on a four wheel open family carriage, and desire to say that the model at the fair does not convey an idea of the perfection and beauty of the arrangement. We regard this invention as one of the most beau tiful and perfect mechanical contrivances that we have ever seen for accomplishing a desired object.

We would respectfully suggest that the managers should give a conspicuous notice of this invention, as we are confident that if they could all have had an opportunity of examining its application, they would agree with us in the award of a premium which we desire to give it.

No. 562. Interfering Hoof Cushion. (F. B. Doughty.) An ingenious device.

No. 29. Runner for Shoeing Express Wagons. (Eugene Ward.) An ingenious and simple device for shoeing the wheels.

No. 822. Method of Constructing Wooden Pavements. (C. Williams.) Of the three kinds of pavement on exhibition, No. 822 is considered the best, for the following reasons:

It is comparatively noiseless, and likely to remain level, and to injure carriages and horses less than common pavements. It is made of wooden blocks, creosoted to prevent rot, and saturated with asphaltum to prevent absorption of water and consequent swelling and shrinking. It is laid on a bed of concrete, a thin stratum of cement made of asphaltum and sand is poured hot upon the concrete, and the blocks are set in it and pressed down to a level, so that when cold they are solidly united to the concrete bed. There are dove-tail grooves at the joints, and at intervals in the faces of the blocks to prevent slipping. Wooden keys are put in the junction grooves, to lock the blocks, so that they could not move up or down if laid on a weak foundation. Hot asphaltum cement is then poured into all the grooves, and aids the keys in locking the blocks together. This asphaltum cement has considerable strength, and is expected to hold the pavement together, so that the blocks will not settle individually, in case the foundations become defective; but it wears faster than the wood, so that the action of the horses' feet will constantly keep the grooves open to a sufficient depth.

When it is expected that the pavement will be taken up to lay pipes, a little sand may be sifted over the concrete cement, to prevent the blocks from sticking to it, so that they cannot be lifted. When a block is to be taken up, hot plates of iron are passed into the grooves, the concrete cement is melted, and the block can be lifted.

The judges consider this the best pavement on exhibition, but they have so little knowledge of several other wood pavements now before the public, that they cannot with propriety give an opinion on its comparative merit. But they believe it will prove an excellent pavement if laid as proposed, on a good foundation of concrete.

E. RICHMOND, } Judges.
W. P. TROWBRIDGE, }
J. K. FISHER, }

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## THIRD GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned, judges in Department VI, Group 3, report that they have carefully examined twenty-four articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges:

No. 104. Model of Golding's Life Preserving Mattress and Raft combined. (John Golding.) The Judges are of opinion that this contrivance is one of the best yet devised for saving human life in cases of disasters to ships at sea. It consists in attaching to each mattress used on shipboard, a frame work of cork, securely fastened together, capable of supporting a weight of two hundred pounds. These frames are surrounded by cords and loops, by which a raft of mattresses capable of supporting the whole ship's crew and passengers can be constructed in a few minutes. There is also provision made for carrying food, and water for drinking. In view of the numerous disasters and loss of life at sea, the judges recommend this contrivance to all ship owners; and vessels adopting it should command the confidence of travelers, in preference to such as make no provision save the uncertain one of the ship's boats.

No. 233. Union Power Capstan. (Spaulding & Coffin.) After a careful and minute examination of this capstan, the judges are of opinion that the inventor is entitled to the advantages which he claims for it over the power capstan now most generally in use, and they refer the board of managers to the following for a more particular and minute description:

"The patent Union power capstan combines the following advantages, very few of which are found in any other capstan in use, and in no other are they all, or nearly all, combined: 1. The men travel with the levers, always in the direction in which the barrel winds. 2. It winds in either direction at pleasure, as a simple capstan. 3. It winds in either direction at pleasure, as a power capstan. 4. The free working of the capstan in both directions, prevents the necessity of fleeting the line, unless it is desired, and any over-riding is also thereby easily corrected. 5. Our gears are perfectly at rest when the simple power is used, while the spindle bearings are unchanged. 6. The capstan remains perfect and unobstructed, as a simple capstan, in the contingency of a possible derangement by breaking of gears or otherwise, of the power arrangement. 7. A patent provision is made for the application of a block, so as to draw a line from aloft, at an angle, in any direction. 8. There is a more powerful purchase than in any other power capstans, viz. four and one-half to one. 9. There is no torsional strain on the spindle, as the gear purchase communicates directly with the bed plate. 10. We have a safety, elastic element in our plan of construction, insuring the equalized action of all the gears. 11. All working parts become perfectly accessible by simply removing a pin in the top of the shaft. 12. All laboring bearings are on metals not subject to rust. 13. The gear wheels are of the best metal for the purpose. 14. The capstan is not liable to become inoperative from neglect or rust, and all parts are detachable with the greatest facility. 15. The side shafts have a tin coated surface within the upper gears, so that the last and only chance for rust to prevent the free taking apart of the entire machine on shipboard, is entirely removed. 16. Our patent conical gear arrangement secures a facility in moulding which insures finer castings, and better surfaced gears than other plans. 17. Our patent arrangement affords us the facility, and we therefore reinforce all the gear teeth with abutting flanges. 18. There is not the common but objectionable jutting out of the upper part of the barrel, found in most power capstans; on the contray, it is free from anything to interfere with the free manipulation of the line or cable over and around the capstan. 19. We have combined greater originality and more perfect letters patent protection, probably, than is found in any other capstan in existence."

No. 750. Screw Steering Apparatus. (James L. Jackson & Bro.) This seems to be a valuable improvement in the methods heretofore used for steering ships, when the helmsman is placed near the rudder.

No. 628. Models of Yachts. (David Kirby.) Several models of yachts. The best on exhibition.

No. 627. Model of a Boat Detaching Apparatus. (Samuel Brown.) There are four models of boat detaching apparatus. Of these the one, in the judgment of the committee, possessing the highest merit, is No. 627, known as Brown & Levil's patent. The judges are not only of opinion that it is the best model on exhibition, but the best known to the public.

No. 775. Working Model of a Steering Propeller. (F. G. Fowler.) This method of propelling and steering a vessel is novel, and in the absence of any experience of its qualities and merits, the judges are not prepared to express any decided opinion. If, on trial, it shall be found free from any serious defects in mechanical arrangement and combination, they are of the belief that it may be found valuable for canal and river purposes, and they therefore hope to see it put into practical use on a scale sufficiently large to test its merits.

H. B. WILLSON,
W. W. VANDERBILT, } *Judges.*

## FOURTH GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department VI, Group 3, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised, in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges:

No. 1141. Telegraphic Relay. (L. Bradley.) Relay wound with naked copper wire. As we regard this method of winding an electro magnet an important advance over the ordinary method, since it puts less resistance in the line for the same strength of magnet, we would recommend a first premium. In the same case a "tangent galvanometer and rheostat" taken in connection, give an easy and satisfastory method for testing the strength of electric currents, and the resistance of electro magnets. The galvanometer is different from any heretofore constructed, being composed of a series of needles placed side by side.

It is claimed that the deflection of the needle in this instrument when under the influence of electro currents is directly proportional to the angles themselves, and not to the tangent of the angle, as is the case with a single needle. For ordinary use this form is preferable, but for delicate observations in weak currents, we would prefer a single needle.

The invention, however, is worthy of honorable mention in the report of the board of managers.

No. 966. The Telegraph Register. (L. G. Tillotson & Co.) This register we regard the best on exhibition. The method of shifting the fillet of paper, although not new, is convenient; the general construction of the instrument is good. We recommend a second premium.

No. 42. Sub-Marine Cables. (The Bishop Gutta Percha Company.) In this case there was a large number of specimens of sub-marine cables. Of the relative or absolute value of these specimens, the judges had no positive knowledge, but as an encouragement to American manufacture, we would recommend a third premium.

No. 1157. Parafine Telegraph Insulator. (William R. Allison.) Tests have been made by competent persons, showing that in damp or rainy weather there is less escape of electricity over these insulators than any other in use. It may be objected, however, that their cost is much greater than for the glass and bracket in other forms. As the problem of telegraph insulation is a very important one, any invention tending towards its solution should receive all needful encouragement. We accordingly recommend a third premium.

No. 467. Magnetic Railway Switch Alarm Signal. (Thomas S. Hall.) This method if properly carried out, we regard as of great value, in preventing a certain class of railroad accidents; it is new. We recommend a first premium.

No. 1038. Electro Medical Apparatus. (Jerome Kidder.) Without admitting the value of direct or indirect currents of electricity for the cure of disease, yet we regard this apparatus as the most complete of the kind in use.

No. 831. Dion's Fire Detector and Alarm Bell Apparatus. (American Fire Detector Company.) This device is simple and ingenious. It is based on the principle of the metallic thermometer. We recommend a second premium.

No. 697. Apparatus for Lighting Gas by Electricity. (Samuel Gardiner.) This apparatus is intended for lighting a small chandelier by means of frictional electricity. It is well adapted to the purpose.

G. W. HOUGH,
JAMES CROWLEY,
DUBOIS D. PARMELEE, } *Judges.*

No. 1534. Pneumatic Postal Despatch. (Alfred E. Beach.) The judges appointed to examine the pneumatic postal despatch, respectfully report that they have carefully examined the working of the one on exhibition, and recommend that it be awarded a first premium.

JOHN B. RICH,
F. E. ENGELHARDT, } *Judges.*

## FIFTH GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned, judges in Department VI, Group 5, report that they have carefully examined the several articles referred to them. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of the deliberations of the judges:

No. 905. Letter Presses and Tables, Cases and Stands, Double Stand and Case, Eagle Cabinet. (R. Hoe & Co.) For variety of manufactures, excellence of workmanship and superiority of copying pressess.

No. 383. Newspaper Directing Machine. (Milo Peck & Co.) The best newspaper directing machine. Special merit in method of making type light to handle and legible.

No. 119. Graining Machine. (Heath, Smith & Co.) Special merit for novelty, utility and economy.

No. 649. Type Setting and Distributing Machine. (John F. Trow & Co.) Special merit for simplicity and practical utility.

No. 140. Card and Billhead Press. (George P. Gordon.) The best card and billhead press.

No. 530. Printing Press. (Woods & Tuttle.) Special merit for novelty in method of arranging chase, and for durability.

No. 252. Printers' Rollers. 'Francis & Loutrel.) For improvement in printers' rollers.

WM. H. MURPHY,
THEO. L. DE VINNE, } *Judges.*

## Department VII.

### FIRST GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned, judges in Department VII, Group 1, report that they have carefully examined the several articles referred to them. The following is the result of their deliberations:

No. 1357. Collection of Dahlias. (C. S. Pell.) A large and most splendid collection of dahlias, renewed frequently from the opening to the close of the exhibition.

No. 1118. Collection of Dahlias. (A. G. Burgess.) Twenty-four varieties of very large and perfect dahlias, many being new seedlings, never before exhibited, and the exhibition kept up from the commencement to the close of the exhibition.

No. 1223. Collection of Dahlias. (Mrs. Wilson.) A fine collection of dahlias, and renewed twice each week from the commencement to the close of the exhibition.

No. 1304. Basket of Choice Flowers. (Hanft Brothers.) A most beautiful and large fancy basket of choice and rare flowers.

No. 1435. Collection of Roses. (Wm. A. Burgess.) A great variety of the best roses known, and some new seedlings.

No. 1187. Collection of Plants. (L. L. Whitlock.) A fine collection.

H. DOE,
ISAAC BUCHANAN, } *Judges.*

### SECOND GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department VII, Group 2, report that they have carefully examined the several specimens of fruit referred to them. The following are their conclusions:

No. 1371. Collection of Pears. (C. M. Hovey & Co.) This collection of seventy-three varieties of pears, many of which are native seedlings of superior quality, and a large number of new and improved European seedlings.

No. 1285. Collection of Pears. (William L. Ferris.) This collection of pears of fifty-five varieties, is valuable for the many new American seedlings introduced, of superior merit, as well as the best foreign improved sorts, and is of value.

No. 1318. Collection of Pears. (C. Dickerman.) This collection of pears of one hundred varieties, comprises a large number of new and improved varieties, some of them exhibited for the first time. The specimens are very large and of fine quality, which must be the result of superior cultivation. This being an amateur collection, we consider it entitled to the first prize.

No. 1195. Collection of Pears. (S. Springstead.) Nineteen varieties of pears, very finely grown specimens of the best kinds.

No. 1506. Three Varieties of Pears. (S. C. Barnes.) Extraordinary specimens in size, of the varieties grown in the city of Brooklyn.

No. 1285. Collection of Apples. (William L. Ferris.) Twenty varieties of apples; fine specimens, and well grown.

No. 1279. Collection of Fruit. (E. Williams.) A fine collection.

H. DOE,
ISAAC BUCHANAN, } *Judges.*

## THIRD GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department VII, Group 3, report that they have carefully examined the several products referred to them. The following are deemed worthy of premiums:

No. 1542. One Hundred and Five Varieties of Potatoes. (D. S. Heffron.) This collection comprises all of Mr. Goodrich's seedling varieties worthy of retaining; also sixty-two seedlings, introduced by Mr. Heffron, many of them showing valuable qualities. There is also, in addition, a collection of the best old varieties, all well grown; total number of varieties, one hundred and five.

No. 272. Collection of Potatoes. (Reisig & Hexamer.) A most valuable collection of well known varieties of potatoes, including many newly introduced seedlings, which are promising.

JOSIAH H. MACY,
N. C. MEEKER,
S. EDWARDS TODD, } *Judges.*

## FOURTH GROUP.

*To the Board of Managers:*

Gentlemen—The undersigned, judges in Department VII, Group 4, report that they have carefully examined the several articles referred to them. Taken collectively, these specimens of skill and ingenuity furnish evidence of continued advance and improvement in the methods used to accomplish a desired end. In deciding upon the comparative value of the samples entered for competition, great scrutiny has been exercised in order to weigh impartially the evidences of utility found in each. The following is the result of their deliberations:

No. 911. Grape and Flower Scissors. (S. W. Valentine.) They consist of an ordinary pair of pruning shears, with a circular blade ground sharp upon the edges and attached to one of the blades or shears by means of a screw. When dull they can be easily sharpened by unscrewing the circular blade and grinding it. It remains sharp much longer than an ordinary knife on account of the sharp surface not being so much exposed. It is a novel idea and a very good one.

No. 64. Steel Plows. (Collins & Co.) The four models are the most perfect ot any on exhibition. With many of the manufacturers of agricultural implements very inferior wood is used, which breaks at the first severe test received. The manufacturers often render themselves liable to censure and many severe criticisms for their want of liberality. With the above mentioned plows great care seems to have been taken to finish all in a substantial and workmanlike manner. The beams are made of good, lasting, tough wood, and all about them seems to have an air of durability and strength which is quite satisfactory.

No. 338. Miners' and Railroad Picks. (H. L. Lowman, Washoe Tool Company.) The picks and pickaxes entered by the Washoe Manufacturing Company are a very great improvement on the kinds formerly used. The eye of the picks, from the form of construction, is much stronger than the old patterns; the handles are more easily put in and are much stronger when they are in. Their collection on exhibition gives them much credit.

No. 272. Prong Hoe. (F. M. Hexamer.) Its merits are, its usefulness as a potato digger. The tines are about nine inches long, and it is said it serves a better purpose for digging potatoes than anything else. It has taken the place of the old potato hook entirely in the western part of this State, where they make a specialty of raising potatoes.

No. 190. Cement Sewer Pipe. (Knight & Woodward.) We think this to be an important material of great value for sewering purposes.

No. 676. Drain Tile. (D. W. Seeley.) This tile has the property of resisting the action of frost, and is consequently of great value to the farmer.

JOSIAH H. MACY,
N. C. MEEKER,
D. S. HEFFRON,
} *Judges*

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## FIFTH GROUP.

*To the Board of Managers:*

GENTLEMEN—The undersigned judges in Department VII, Group 5, have carefully examined the several agricultural implements referred to them, and report upon those most approved as follows:

No. 48. Combined Mowers and Reapers with Self Rake. (Adriance, Platt & Co.) The article bearing the number 48, is decided to be the best on exhibition. Its merits are, its practicability; it has been conceded by farmers and practical men that this machine has given the best satisfaction of any in use for the last five years, as a mower; it is a light draft machine, of rapid motion, very durable without being too heavy; is well made, and does its work well; it can very readily be changed to a reaper; the attachment is easily adjusted, and the self rake works to perfection, and is a very great saving of physical labor; none can realize, except those that have learned by experience, the labor of raking all day in heavy grain; the initiated will fully appreciate its usefulness; the arms of the rake are easily controlled; in light or heavy grain you can throw off a sheaf of any size; one very important feature in the possession of one of these machines, is the attention given by the manufacturers to the immediate perfection of any machine needing repairs; the different pieces are numbered and recorded, and in case of breakage, within twenty-five miles of New York city, duplicates can be obtained in three hours, and your machine soon repaired; their business arrangements are conducted with that system and attention that always insures success.

No. 90. Mowing Machine Knife Sharpener. (A. C. Hasbrouck.) Its merits are: 1. Its simplicity; there is but little about it to get out of order; it consists of an emery wheel, conical in shape, with a rest upon which the knives to be sharpened are placed; the edges of each knife are presented to the surface of the stone at the same angle, which insures a more perfect edge, and prevents any nicking or uneven grinding; it is a very important item with all farmers, to be able to keep their mowing knives in good order; the difference made in the draft of a machine with knives in passable order, or in excellent order, is truly surprising, and is readily perceived by the working of the horses; many farmers are without any mechanical skill, and are unable to keep their knives in good order, without the assistance of something of this kind. 2. The absence of all danger to the person turning the wheel, and the comparative safety of the person grinding the knives; the emery stone is turned by the application of power from a large wheel some six feet in diameter, by means of a twisted cord; the large wheel is at least six feet from the stone, so if the knives should slip, there would be no danger of getting cut; the rest for the knives is a great support to the person grinding, and in consequence there is less liability to accidents.

No. 402. Empire Windmill. (R. H. Allen & Co.) This is decided to be the best on exhibition. Its merits are, its capability of adjusting itself to the violence of the gale, by the opening of the blades and wings, and allowing the wind to pass through. This is very essential to the perfect success of a windmill; many of them are so constructed as not to admit of this, and consequently they prove failures. The workmanship of the above mentioned mill is worthy of praise.

No. 416. Hay Rake. (Oscar Washburn.) Its merits are: 1. The teeth of this rake are of such construction, they can be easily repaired by any blacksmith, which is not the case with all. 2. It can be relieved of its load very easily, more easily than others; it is simple, and not likely to get out of order; cheaper than many; and the teeth are in front of the wheels; your work is in sight when using one, and the horse nearer his labor.

No. 313. Specimens of Scythes. (Greenwood Scythe Company.) The above is an elaborate display of scythes of all kinds and descriptions, the common grass scythe varying in width and length; the large cradle scythe, stubble scythes, and a number of corn knives, all are splendid specimens of mechanical skill and labor. The corn knives are an improvement most decidedly on those in use heretofore. The whole display does credit to the exhibitors.

No. 418. Burrell's Corn Sheller. (R. H. Allen & Co.) The whole number of corn shellers on exhibition is four. The article bearing the number 418, is decided to be the best on exhibition.

Its merits are: 1. Its durability; it is made entirely of iron, and is very substantial. 2. The rapidity with which it shells. 3. Its capability of separating the corn from the cob.

It is more compact, occupying but little room, and it works to perfection for a hand machine; it cleans the cobs very clean, and in fact, is the most approved machine for the general use of farmers.

The other machines were the old fashioned kinds, mixing corn and cobs together. But little improvement has been made with shellers. A power sheller that will separate corn from the cob is much wanted.

No. 363. Corn Harvester. (Thomas Butterworth.) The judges considered this machine deserving of a first premium.

JOSIAH H. MACY,
N. C. MEEKER, } *Judges.*
S. EDWARDS TODD,

No. 285. Combined Cylindrical Harrow and Broadcast Seed Sower. (Amos Newell.) The undersigned judges appointed by the American Institute to examine a machine which was exhibited at the American Institute fair, 1867, by Amos Newell, of New York city, for harrowing and cultivating the soil, most respectfully report, that we have witnessed the operation of said machine, known as the "combined cylindrical harrow and broadcast seed sower," on a piece of ground on the premises of William S. Carpenter, Esq., in the town of Harrison, and were much pleased with the result shown.

It was driven over a piece of ground that was slightly undulating, with here and there a turnip or stone interspersed, and did its work well. It pulverized the ground very nicely to the depth of three or four inches, and dug the turnips to perfection, and we see nothing to prevent its successful operation in ground free from large boulders.

A very important item with all farmers, and particularly with large gardeners, is thorough cultivation. The use of this machine obviates the necessity of such continual rolling and harrowing to break up the lumps, level the ground, and put it in condition for the seed. The ground is not driven over as frequently, and consequently not packed as hard. The teeth of the revolving cylindrical harrow are in the rear of all machinery, and the application of the teeth to the soil is such as to give the dirt an upward and backward movement, which leaves the ground in splendid condition, loose and well pulverized.

This harrow was also worked on a piece of inverted sod ground, on an adjoining farm which was being prepared by its owner for a crop of raspberries. Its work here was also very good; it leveled the ridges, and pulverized the land exceedingly well.

The conclusion arrived at by the committee and gentlemen in attendance was, that the ground where this harrow had been twice driven over, was in better condition by far than a piece of the same plowing, side by side, which had been harrowed over three or four times with a square harrow. With the old harrow many pieces of sod were turned up again, while with the new, if any were turned up, it was so finely pulverized that it was not visible as a sod.

The draught is exceedingly light. It was drawn by a pair of oxen that seemed to walk off with it with all ease. We judge the draught to be not over three-quarters that of the square drag, if more than one half.

We think it an admirable machine for smooth land, and do not hesitate to recommend it for the purposes herein mentioned.

The first cost of these machines must be far more than of the old harrow; but if manufacturers do not charge exorbitant profits, but will place them in the market at a reasonable price, the immediate demand from well-to-do farmers and gardeners will richly compensate them therefor.

JOSIAH H. MACY,
WILLIAM H. SMITH, } *Judges.*
SAMUEL G. HAVILAND,

## SIXTH AND SEVENTH GROUPS.

*To the Board of Managers:*

The undersigned respectfully recommend the following premiums:

No. 618. Hutchinson's Wine and Cider Press. (J. R. Decatur.) This is a combined grinder and press. The judges deem it to be a valuable labor-saving machine and worthy a premium.

No. 588. Elastic Horseshoe Cushions. (A. B. Gray.) This is an India rubber cushion to be placed between the shoes and hoofs of horses when they are being shod, for the purpose of removing the heavy and injurious jar which the animal receives when traveling over pavements and hard roads. They think this an excellent device for tender footed horses, and they would make honorable mention of it.

No. 109. Cliff's Aerating Churn. (J. W. Douglass.) We think this churn worthy of honorable mention.

No. 620. Tingley's Patent Churn. (J. R. Decatur.) This is entitled to a third premium.

No. 619. Hay and Straw Cutter. (Warren Gale.) This is an excellent machine for chopping all kinds of coarse fodder; but as there is no competition the judges agree in making honorable mention of it.

No. 110. Butterworth's Jersey Apple Grinder. (J. W. Douglass.) The judges are pleased with the appearance of this machine.

No. 371. Automatic Manger and Feed Box. (Denzler & Miller.) The judges make honorable mention of this contrivance.

No. 670. Copper Weather Vanes. (J. W. Fiske & Co.) Twenty-two copper vanes were submitted to our inspection. They are superior articles, and entitled to honorable mention.

No. 840. Carriage Jack. (G. L. Cummings.) A good article, and entitled to honorable mention.

S. EDWARDS TODD,
JOHN CRANE,
E. WILLIAMS,
} *Judges.*

No. 413. Bag Holder. (J. V. Henry Nott.) The merits of this bag holder are: 1. Strength; the rim which holds the bag is of wrought iron; is square in form; and can be raised or lowered upon the upright which supports it, the weight of the bag, acting as a lever, keeps it in its place. 2. Simplicity. 3. Durability, hard wood and iron.

No. 751. Patent Fruit Basket. (David H. Priest.) A basket for picking fruit, which can be readily unloaded by the picker in the tree, without descending. The bottom is so arranged that by means of a wire it will drop, or open, when required, and empty the fruit, apples, or pears upon the ground, and close again. It will do what it was invented to do, to perfection; but whether that is the proper way to handle choice fruit or not, is a question.

No. 45. Cover for Pickle Barrels. (H. L. Chace.) This cover is really a very ingenious device and of much value to those who pack their own pork or beef.

No. 1431. Automatic Pump, for cattle. (J. S. Patric.) The judges recommend this contrivance for the first premium.

JOSIAH H. MACY,
N. C. MEEKER,
D. S. HEFFRON,
} *Judges.*

## SEVENTH GROUP.

No. 483. California Vegetable Hair. (Treadwell & Co.) The judges recommend this vegetable hair for honorable mention.

S. EDWARDS TODD,
JOHN CRANE,
E. WILLIAMS,
} *Judges.*

# ADDRESSES

AT

# THE THIRTY-SEVENTH ANNUAL EXHIBITION OF THE AMERICAN INSTITUTE.

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## OPENING ADDRESS.

BY HON. H. GREELEY.

*Ladies and Gentlemen:* In this metropolis of the commerce of the New World, the American Institute uplifts the banner of labor and of creative art. We are here distinctively as the champions and representatives of labor, as employed and exemplified in agriculture, in manufactures, and in mechanics. We are here not to place labor in antagonism to trade, not to affirm its ability to dispense with the vivifying agencies of commerce; we are here only to assert and maintain that production is primary to and more important than distribution—that to produce is more necessary, more vital than to exchange, and should have the first consideration in all generous and beneficent public policies. The American Institute maintains the essential harmony of all useful pursuits, the necessary and natural relation of sympathy, cordiality and mutual support, between all these beneficent creative interests. We affirm that commerce should be the servant or ally, not the master, of industry, and that the policies of governments and the efforts of statesmen, philanthropists, rulers, and all wise men, should be guided and governed by this fundamental truth. We would have trade flourish, but only so fast and so far as shall minister to the thrift and well-being of labor. This exhibition testifies that industry has another and nobler function than the mere satisfaction of animal appetites or material wants. We hold that labor is fundamentally the education of the race, the elementary mainspring of its progress from savageism up to the very highest condition of civilization and enlightenment. Even though we were to admit that a people might more advantageously, that is with greater material profit, satisfy their wants by following only one branch of industry—say, timber-cutting or corn-planting—and by exchanging its products for everything else they required, it would still be a mistaken, unprofitable, and unwise policy; because a nation which does but one thing, *learns* but one thing; because a nation which has but a single pursuit has but a limited intellectual as well as industrial development. It would be essentially a barbarous, that is an unenlightened nation, although it might by such a policy easily satisfy all its material wants. It is through the development of a thousand industries, of all the infinite subdivisions and correlations of labor, that the progress of the mass of mankind is incited, is stimulated, is secured. The field, the shop, the factory, the furnace, the foundry, together constitute the people's university. What one learns in one kind of labor is communicated by electric sympathy to all the rest; and a people that follows fifty or five hundred different pursuits is wiser, individually and collectively, than any other people can be that follows but a single pursuit. A diversified industry is the basis of national strength, in war as in peace. The strength of the New Englanders is in their many-sidednesses, as has so often been exemplified. When, at the very commencement of our late civil war, the frigate Constitution, our good old vessel, was aground in Annapolis harbor, and the commander of a Massachusetts regiment asked, "What man in the ranks can navigate this vessel, let him step to the front," at once fifty-eight men stepped forward, each prepared to take the good old ship out of the harbor or to fight her in it, as the exigencies of the case might require. It was this adaptiveness, this great multiplicity of the capacities of our people, that, more than anything else, carried the nation through that great struggle. Our fellow citizens on the other side were able, were brave, were thorough, were determined; but they lacked the capacity that invents everything from a gun up to a Monitor under the pressure of sudden and unforeseen emergencies. National, industrial, mechanical ability is to-day one great source of safety and security in peace and in war. No people knows all, no nation knows enough; but that people which knows most is best prepared for any great exigency of strife or convulsion. Had we been still wiser at the commencement of our struggle, had we then had men in our ordnance and engineering departments who understood as we now understand the superiority of the breech-loader over the muzzle-loading rifle or musket, our war would have been two years shorter, and our national debt $1,500,000,000 less than it is to-day. There are many now standing before me, whose hearts palpitated on that eventful Sunday when the morning brought us news of the devastation of the Merrimac in Hampton Roads, and you all remember how, after a day of trepidation and apprehension, the evening brought us tidings that her career had been checked by the sudden appearance of the little Monitor—"a cheese-box on a raft"—which had been fitted out in New York only twenty-four or thirty-six hours before. It was the critical moment. Three days thence might have seen Washington devastated or burned, and all the enormous stores of war material there collected might have been the spoil of the enemy if that little vessel had not been ready for service until two days later. Our war showed great national resources, not on one side only, but on both. At the beginning, we were tempted to undervalue the mechanical skill and resources of our adversaries. We believed that all mechanical knowledge was in the North, and only the need of it in the South; but, "necessity is the mother of invention," and before the contest had continued long, we were compelled to respect and defend ourselves against a skill in the invention of torpedoes, and even of armored vessels, which we had no conception had any existence among our opponents. Their harbor defences were among the best that were ever contrived on the face of the earth, with equal material and pecuniary resources, and from them, at that time, we learned not to despise the capacity of any people who are earnest and resolute. Sixty years ago, there were American statesmen of no mean capacity, and of decided influence, who believed it wisest to keep this wholly an agricultural country. They admitted that an agricultural people was not likely to be a wealthy people, nor a remarkably powerful people, except on their own soil; but they said, "There are so many errors, so many defects and vices, that follow in the train of manufactures, that we may better keep them in Europe, and minister by our agriculture to her wants as she ministers to ours." While our people lived on the tide-water, that was a plausible though not a sound theory; but when we became a nation spread over 1,500 miles inland, as well as 3,000 miles of coast, it became an entirely impracticable theory. To-day, not half our agricultural products would pay for their transportation to the Old World. It is not possible to-day to export the timber, the fuel, the ore, the coal, that make up so much of this nation's wealth, at any rate whatever. We have been compelled to be a manufacturing and mechanical nation by the necessity of our position, by our expansion, by the thousand needs of our extended national existence.

What have been the leading results of the planting and growth of the mechanical arts and manufactures on this shore of the Atlantic? In the first place, I call attention to the fact that the naturalization here of the industrial arts has been the occasion, I may say the cause, of enormous and beneficent developments of invention, of economic labor-saving construction, and of applied science. The Old World is to-day more than $1,000,000,000 richer for the inventions and adaptations which have had their birth in this country, and which, had there been no American manufactures, would, in all human probability, have remained to this day undeveloped. The cut-nail, an immensely labor-saving device, which has made cheaper the building of houses all over the world, is a result of the planting of the industrial arts in America. I have been told that the screw-auger, by which a quadruple power has been given to mechanic art in one important department, was the invention of a Connecticut Yankee, who never even patented it.

It is a common complaint, often rëiterated, that American manufacturing industry never gets out of the stage of infancy, that it is always crying for protection, as if it had made no progress, and was not likely to make any. Now this misstatement is founded on a truth. In the development of industry, there are always new branches which require encouragement; but in this country the old established branches of manufactures and mechanics do not require any protection. There are no countries on earth where plain cotton and woolen fabrics are made cheaper than they are in the United States to-day. There is no country where the relation between the prices of wool and cotton on the one hand, and of plain substantial woolen and cotton fabrics on the other, is closer than it is here. There are branches of our cotton and woolen manufactures which do require protection, but those old fabrics which we began to make first, and which we have learned to make best, if you give our American manufacturers their wool and their labor as cheaply as they are supplied in the Old World, they can make and sell as cheaply as any people on the face of the earth. Our manufacturers challenge fair competition; but, being called upon to pay taxes on every yard they make, and on every element that enters into their production, and being compelled to pay a double or triple price for labor, is it fair or just to complain that they cannot make and sell goods subject to all these taxes as cheaply as they may sometimes be made and sold in Europe? But take another and very large class of American manufactures, our edge-tools. No nation on earth can make them as good in quality, or as cheap in price, as we can make them here. Sixteen years ago, I went to Europe in company with the first President of the Republic of Texas, Col. Ashbel Smith, late of the Confederate army, who told me that, some time before, thinking the reported superiority of Yankee tools all humbug, he had bought a liberal assortment of the best edge-tools he could find in Great Britain, "and," said he, "I could not get a single mechanic to use them, the American tools were so much better and finer in quality." So to-day there are selling in different British Colonies large invoices of Ames's shovels and spades, which, after paying British duties, are still able to undersell British manufacturers in their own market. Our reapers and mowers defy competition, and take premiums in British and in French World's Fairs. There is really no substantial competition against us in those articles. American reapers and mowers are to-day cutting and gathering the harvests of the civilized world; and this, in spite of the enormous cheapness of European labor. A British nobleman said of McCormick's reaper, when I was there sixteen years ago, "It is not a question of cheapness at all with us; we have often only two or three dry days in the harvest season, while we have hundreds of acres of grain to harvest. Now, if we can get a machine that will reap ten or fifteen or twenty acres in one day, its value to us will be incalculable, although the cost of reaping may be as great as would that of reaping by hand, because of the saving in time, and because it will enable us to improve the favorable season, so short and so precious." Our sewing machines also, thoroughly American in their conception and in their perfection, are to-day clothing the armies of the civilized world; and before long they will turn the blankets and girdles of tribes that are now barbarous into shapely and graceful garments. The electric telegraph, too, which was first made practicable by an American, now flings its net-work over all nations, and the honor of first conceiving and finally achieving the electric union of the rival hemispheres is justly due to a citizen of New York. No man can now estimate what is to be the value, the power, the civilizing influence, of this agency, which is not yet a quarter of a century old, which has already thrown its wires across from continent to continent, and which to-night is rendering accounts of the markets in all the cities of the civilized world. But we claim no monopoly of creative genius. We gladly admit that the steam engine is British, though the steamboat is clearly American. The spinning-jenny and the power-loom are European in origin; but the genius of Bigelow and other Americans has greatly increased their capacity. It was hard to find one who could add to the masterly invention of Jacquard, but our Bigelow did it. The railroad and locomotive did not originate with us, but our people have made a larger and better use of them than any other on the globe. The steel of Bessemer is a great stride; but give us a few years of prosperity and we will surpass it. The Pacific railroad is about to revolutionize the world's commerce—to make New York and San Francisco only halting-places on the shortened line of transportation from Shanghai to London and Amsterdam. We are yet only in the beginning of that great enterprise, the grandest the world ever saw. No man here, no man anywhere, comprehends fully now what that railroad is to do for our country and for mankind. Eight years ago, I traversed the line of it, mainly with reference to what it was to do for us; and although I believed that enormous wealth was to be developed by it—not merely of gold and silver, but also of the more valuable metals, tin, iron, lead and copper—yet far more than I dreamed has already been realized; and I say now that the Pacific railroad cannot be built without uncovering wealth which will more than repay the entire cost of its construction.

The American Institute stands, and has stood, the advocate of protection to American industry, wherever it stands exposed to unfair and withering injury from foreign competition. It is just as unreasonable and unfair to complain that a particular interest needs protection, as it is to complain that a particular citizen who stands on the frontier of our country, defending it against savage or civilized foes, needs to be clad and fed while he stands there a soldier for the defence of the whole country. Every branch of industry sympathizes with every other. If we were to-day to blot out our iron-works, do you not see that we would at the same time blot out an enormous demand for our cattle, pork, hay—for everything which enters into the profits of the mechanic and the farmer—while several hundred thousand men who are now profitably employed in that industry would be thrown back to glut other pursuits, thus diminishing the rewards of labor in every field. And so would it be if any other branch of manufacturing industry should suddenly cease. We demand that protection shall be the policy, not of this nation alone, but of every nation, and especially of new nations. The nations of South America and of the West Indies, as they become independent, shall encourage the development of new kinds of industry within their own territories. I have no doubt that the new-born Italian nation—one of the most joyful and happy births of the century—would find her finances immensely improved and her strength in every department largely increased if she were, by an efficient protective tariff, to secure the manufacture on her own soil of every fabric and every metal for which she can find upon that soil the essential bases, raw material and labor. I have no doubt that other nations may be built up in wealth and strength, as the German nation has been built up in our own day, under the beneficent influence of her Zollverein tariff. I have no doubt that the time is to come when Liberia, Hayti, and other young republics of this and of the other hemisphere, will largely increase their prosperity by giving judicious and efficient protection on their own soil to very many fabrics and wares and machines which they now buy from others. If this American Republic had never protected, and therefore never developed home industry in its manufacturing and mechanical departments, I believe that its imports at this time would be much less than they are; because our ability to buy and consume would be so much less. Lowell buys and consumes more foreign fabrics than Arkansas. Thus we would strengthen everywhere the arm that strikes for subsistence, for competence, for wealth, if you will, but ultimately and inevitably (in its effect) for country and for mankind. This fair is a hastily gathered miniature view of the recent advances, the present state, of American industrial art. It might have been larger, more varied, more perfect. Nay, it *will* be ere it closes. We are but in the alphabet of our industrial education. We mean to show you every year henceforth a better and still better fair. This exhibition is not so large as it would have been, could we have found a proper and adequate place. But this place is the very best as yet afforded by our city. We have been compelled to refuse contributions that should have been received, but for which we could not make room. It is a shame that this great metropolis has temples for art, for science, for faith, but no fitting or adequate depository for the trophies of industry and useful art. This reproach must not abide. It *shall not.* The American Institute is about to commence the erection of a Palace of Industry, which shall give place to a perpetual as well as to annual exhibitions—each better than the other. We pledge to it all our own savings of forty years, now amounting to nearly $200,000. We shall appeal to the capitalists, the property-owners, the successful inventors, artizans, artists, merchants and mechanics of New York and of the country for generous contributions to the work. We hope to rear a stately edifice that will cover a block and embellish our whole city, at a cost of not less than $1,000,000. We mean to have therein galleries of art, lecture-rooms, conservatories, and, probably exhibitions of models, inventions and machines from all parts of the world. When we shall be ready, when American art and industry shall have received due development, we mean to invite the world to a display of its choicest products, and on the 4th of July, 1876—that is the one hundredth anniversary of the birth of American liberty—we mean to open the most magnificent exhibition that the world has ever yet seen, and to invite the world to come and see what America has done and can do, and to place in competition with it all that has been done or can be done by the rival art and skill of the Old World. We believe we shall be ready—we mean to be ready—by that time, not merely with a palace of industry, but with the fit contents of that palace, wherein American art and genius shall vie with all that the Old World can do, and on equal terms shall challenge exhibition and competition with the captains of industry all over the planet. And thus, trusting that our peaceful triumphs in the field of useful art may radically dim the glories and efface the memories of desolating war, the American Institute bids you welcome to this festival of labor, and, trusting that your generous aid and patronage throughout the fair we are now opening shall encourage and enable us to go on holding better and still better fairs henceforth, and thus make New York the centre, as she should be, of industrial as well as commercial greatness in the New World, and ultimately in the whole world, we bid you welcome to what we now set before you.

## CLOSING ADDRESS.

BY REV. H. W. BEECHER.

The managers regret that they have not been able to procure a full report of the brilliant address delivered by the Rev. Henry Ward Beecher, on the evening previous to the close of the exhibition. The orator spoke, as usual, without notes. It was expected that his words would appear in print the next morning, but the pressure of the crowd around the rostrum was so great that even newspaper reporters were not allowed the requisite facilities for symbolizing the full and sparkling flow of thought that for more than an hour commanded the undivided attention of a vast audience. The following sketch appeared in the *New York Tribune:*

"The large hall of the Twenty-second Regiment's armory was thronged on Friday night by upward of 5,000 persons, flitting from invention to invention, examining the hundred thousand wonders in mechanics, science and art, which the managers of the American Institute have collected from all parts of the continent. The pneumatic railway, the sewing machine of a score varieties, pictures, chromos, cameos, designs in iron, china ware, lifting and weighing machines, &c., all received their due share of attention. From 6 to 8 o'clock a continuous stream of people flowed through the doors of the building, until even standing room was no longer attainable. The announcement that the Rev. Henry Ward Beecher would speak, had doubtless considerable influence in securing so large an attendance, but independently of any such extraneous circumstance the fair possesses sufficient attractions for the ordinary public. At about 8 o'clock the vicinity of the temporary platform was filled by an anxious, expectant throng, and when the Rev. Mr. Beecher appeared he was greeted with the warmest and most hearty applause. In commencing his address, he said, we are accustomed to think of this great metropolis as a commercial city, but, if a ship did not leave the harbor, it would be among the first cities of the world, and out of our own industry and ingenuity there could be gathered an exhibition that would outlast the year in interest. And in this city there ought to be some permanent collection of the results of the skill of our mechanics and inventors, and as in other cities there are collections of paintings, and museums, and libraries which never close, so should there be in New Y rk an American Institute which should, like the great Mississippi river, never cease to flow. If this exhibition of the products of the inventive brain which we see around us to-night in such countless variety, could be transferred to some remote era of antiquity, it would scare the world out of its propriety. Not because it was some necromancer's work, but because it was the result of the mechanical genius of our day, the like of which the world never saw. Even so wise a man as Plato held that it ought to be accounted a crime for a free citizen to become a tradesman; the Emperor Augustus put a man to death because he dabbled in manufactures. The whole spirit of antiquity was opposed to work, and its work, such as it was, was performed by slaves. The free citizen was exempted from all manual labor. It was counted a disgrace. But now work is coming up, and the workman rises higher and higher in the estimation of the ages, and work is with us one of the grandest titles of nobility. It may be thought strange that a gentleman of my profession should lend his patronage to an institution like this; but he would take his place in the front rank. Many are afraid of science, and they have indulged in idle fears that morality might be disorganized by the discoveries of science; but you cannot, in our period of the world, carry any one department far ahead without carrying onward all other departments with it. He alone preaches a true religion who brings up not their consciences alone, but also their hands along with it. You cannot touch society now at any point without ultimately affecting the whole; you cannot secure national progress without carrying education with it. Men who invent bring about more intellectual, more social culture; for business requires as much culture as religion or anything else.

"While we are speaking of labor-saving machines for the abridgement of man's toil, he would tell them that if there is one machine which ought to be invented, it is that which teaches them how to work, and what to work at. The best machine of this kind is that which was invented at the first dawn of creation—Adam and Eve. Put a switch into the parents' hand and teach them how to use it. It is doubtful whether the world will gain anything by labor-saving machines—machines that supersede the love of industry. But when used in an industrious and thrifty community, they augment the being and the life of that community in the ratio in which they annihilate space and time, and the old, worn-out grooves in which the world moved in the by-gone past. In his fifty years he had lived longer than his father could have lived had he existed to the age of Methuselah. Take, for instance, the steam engine. He has traveled more in his life than his father ever did. He can travel more in three days now than his father could in a month. Knowledge increases and papers increase. The administration of knowledge is improving, too, as well as material prosperity, and now we live longer in a day than our ancestors did in a year; and the time is coming when a man will not read telegraphic news, but only the heads of subjects. Industry is a moral force in the world. It is impossible that a man should be an inventor and be a dullard. He that points new things in metal, in leather, in fur, is not merely giving various forms to matter, but to mind. The mind works in every iron machine, turns in every wheel, and every man that invents is spreading the real law of soul. The law of price follows the law of manhood. A man that can only work his muscle has 10,000 men that are his natural rivals; but where a man goes up to a work that requires calculation, nicety, punctuality, his labor goes up; and men that go higher still, get a higher price, and simply because God made it so; that the bottom of man's brain cost least, and the highest, the highest. And so a community that is inventive is progressive; it has a perpetual aspiration for better and nobler things. The age of machinery and invention is not only an age of culture in social matters, but also in religious and political affairs. Machines have become the bones of the world. Mr. Beecher then paid a tribute to the artificers. The men who hold the saw, the file, are not to be forgotten. They are the private soldiers in the grand army of industry; but the general, were it Grant, himself, would not be much without the private soldier. And so don't forget, as you look around you, the sweaty, grimy workman, who stood by the engine and moulded the mighty mass into form. Alluding to the elements of American industry, Mr. Beecher said if he was a Pope—no, a King—he thought he should make a better King than a Pope—no young man should be a journeyman without having a piece of land. There is nothing that anchors a man like ground. A young man that has a good plot in the city, or an acre in the country, with a good adviser in it, gives a mortgage to the State that he will be thrifty, honest, sober, industrious. Such a man the devil soon abandons. Where you have a whole community of laborers, society begins to approach the ideal of American industry. He liked Philadelphia more than New York or any other city in the country, not because it has cleaner streets or broader brims, but because there there is a larger percentage of houses owned by those who occupy them than in any other city in the world. That is the true idea of American industry. It must be also virtuous, and must be deeply rooted in prosperity in the household. This world is like a crate of precious good things just opened. The world is even yet tenanted by men who see not. We have yet but touched the surface. We have but just begun to work the mine and dig out a few of its priceless pearls. He rejoiced that we have so nobly vindicated the system of free labor, and thus made this American continent the pioneer in the race of the world's progress. Free labor has been triumphant from the rising of the sun to the going down of the same. No imagination can conceive or fancy paint the full glory of this glorious picture.

The American Institute had a glorious mission before it—the fostering and encouragement and nurture of the inventive genius of this country. It was now approaching manhood, and he trusted that with every succeeding year it would increase in strength and usefulness and material prosperity, and that before another decade of time elapses, through the public spirit of New York, it will have as a home one of the noblest structures in our city, far richer and grander than any marble temple yet erected to commerce or to art."

# PROCEEDINGS OF THE FARMERS' CLUB.

## RULES AND REGULATIONS OF THE FARMERS' CLUB OF THE AMERICAN INSTITUTE, ADOPTED BY THE COMMITTEE ON AGRICULTURE, FEBRUARY, 1868.

1. Any person may become a member and take part in proceedings, by conforming to its rules.

2. The officers shall be a President and Secretary, to be chosen by the committee, in April, and hold for one year, and until successors are chosen or appointed. In absence of President a chairman *pro tem.* shall be chosen by the Club.

3. Any member, for disorderly conduct, may be expelled by vote of a majority present.

4. The Secretary shall keep the minutes of the Club and have control of the same.

5. The President may at any time call a person to order and require him to discontinue his remarks.

6. The meetings of the Club shall be held every Tuesday, at 1 o'clock P. M., and continue for two hours unless otherwise determined.

7. Discussion shall be confined to agriculture, horticulture, pomology, and subjects connected therewith and what relates to rural improvement.

8. All members of committees shall, so far as practicable, be members of the American Institute.

9. Questions or inquiries shall be made through the chair, but answers must be brief, and not lead to debate.

10. Any person desiring to speak shall rise and address the chair, and avoid personalities, and confine his remarks to the subject before the meeting; and the vote of any person may be challenged, unless a member of the American Institute.

11. No person shall speak more than twice on the same subject, or occupy more than ten minutes, unless by consent of the meeting.

12. Particular subjects may be fixed upon for any meeting, and in that case shall be taken up for consideration at 2 o'clock.

13. The usual parliamentary rules shall govern when not provided for by these rules.

## May 7, 1867.

The regular session of the Club was held on Tuesday afternoon, at 1 o'clock. Nathan C. Ely, Esq., the permanent chairman, called the meeting to order, Mr. John W. Chambers filling the post of permanent secretary.

### COOKED AND UNCOOKED FOOD.

Prof. Vanderweyde.—Once a law was passed in Holland that criminals condemned to death should have no salt in their food; after a time their flesh was filled with worms. Beside salt, cooking is useful to destroy worms and their eggs and germs, particularly in meat, and also in vegetables. The tape worm orginates where pork is used. Jews seldom have the tape worm. This worm expels numerous eggs, which are so small that after passing from the body they float in the air. Other diseases evidently originate from swine's flesh. This is a subject recently investigated, and more undoubtedly will be learned as scientific men pursue their researches.

The professor spoke of horses, sheep and other animals being infected with peculiar worms and parasites which originate in their bodies. So numerous and so easily propagated are some kinds that so soon as water stands a little time and gets warm, they begin to breed in it. Hence the most healthful water is to be found in deep cold wells. Now, although multitudes of eggs of worms and germs of other parasites are laid and found in food, still they cannot live in the stomachs of healthy persons, but are destroyed. It is only when the vital powers are impaired that they get a footing and become enemies to human life. From all these facts we readily conclude that nothing is more important than that food should be thoroughly cooked, though we should avoid the extreme of destroying the juices and flavor by too much heat.

### DRIED SQUASH AND PUMPKIN.

Mr. Morris, Monmouth county, N. J., showed fine specimens of these articles, and thought the business profitable, as the fruit so prepared sells at fifty cents a pound. He gave a remedy for the striped bug, which is buckwheat bran.

### THE DUCHESSE D'ANGOULEME PEAR AS A STANDARD OR DWARF.

Dr. Wm. B. Peck spoke of standard pears as being more promising than dwarf varieties, and gave an instance of an orchard three years old which bore last year, and some trees this year promise to bear half a bushel each. But the planting and culture were the very best. He inquired whether the Duchesse really did well as a standard. In the orchard he spoke of, it promised more than other varieties.

Dr. Trimble, of Newark, State Entomologist of New Jersey.—This has been a disputed point. But Mr. Brill, of Newark, has perfect specimens of Duchesse trees, which for many years, as standards, have borne large crops of fine fruit.

### HORSE POWER.

Mr. N. C. Meeker, as one of the committee on the horse power, having visited Cortland county, read the following report:

"*Farmers' Adjustable Horse Power.*—This, first, is a reel of eight sides, nearly a circle, on the periphery of which runs a chain; from this it passes around a chain pulley on the hub of the fly wheel, where motion is given to the machinery. Two horses work abreast, and eight horses may be used. There are assortments of chain pulleys for giving great or less speed. The power is applied so directly there can be but little friction.

"The committee saw this power work as follows: First, with a drag saw. One horse sawed a green beach log sixteen inches in diameter, in a working pace, at the rate of once through in a minute and a half. Several trials were made where it was done in a minute. Second, with a circular saw and two horses, half a cord of dry, mostly soft, three feet wood was sawed once in two in four and a half minutes. Third, with one horse, half a cord dry, hard wood, sawed as above, in six minutes. The weight of the horse was 868 pounds; of both horses, 1,692 pounds. The weight of a fair farm horse should not be less than 1,000 pounds.

"This power seems capable of doing every variety of farm work, from churning or turning a grindstone to thrashing, and to be well adapted to large or small farmers."

### SMOKING SEED CORN.

Messrs. G. M. Early and C. Sanborn, Earlville, Delaware county, Iowa, say that seed corn should be smoked along with the meat in a smoke house, for it will grow just as well, while gophers, chickens, worms or squirrels will not touch it.

### BEST WAY TO PRESERVE HAMS.

Dr. W. H. Wilmot, Lawn Ridge, Ill.—As soon as the hams are thoroughly smoked, cut them up into thin slices, remove the bone, partly fry, as if for the table, then pack the slices in a stone jar, pour on the melted grease, and as much lard as is needed to cover it all, and set away in a cool, dark place. Only one thing will disturb it. It is so handy to put on the table, the cook will be likely to make frequent calls.

### APPLE BARRELS.

Mr. N. C. Meeker.—Like the peach and berry baskets, these are fast becoming an uncertain quantity. The flour barrel, holding two and three-quarter bushels, was formerly used and is still retained in some localities. Finally a law was passed in this State fixing the apple barrel at one hundred quarts, dry measure, or about two and a half bushels. Like many of the laws on the statute book, it is nearly a dead letter, for of late apple men have been using a pony barrel holding only ninety quarts, or very little more than two bushels. Now, while it is barely possible that a few farmers may sell these small barrels for the price of larger ones, the practice will eventually operate to their injury, for buyers will always give the preference to the lawful size, or flour barrels if they can get them. The retailer marks the size of the barrel with his eye, and while he can measure out fully eighteen half pecks from the flour barrel, he knows that this pony size will scarcely turn out fourteen, and of course, he must buy accordingly. Again, dealers who purchase for shipping, will not have the small size if they can possibly get the large, for besides giving dissatisfaction, the freight and cartage is as much on a small as on a large barrel. Ohio and Michigan apples are now taking the precedence in this market over State fruit, solely because they come in flour barrels. Three car loads of Canada apples, in flour barrels, were recently sold at six dollars and fifty cents per barrel, while a lot of similar State fruit, in the ninety quart size, would only bring five dollars and fifty cents. There is a growing prejudice against these small packages, and a disposition on the part of many buyers to crowd down, even below the real difference to compensate for what they designate an attempted fraud. Farmers should bear in mind that they are paying a large amount in extra cost of making the barrels —one size being of the same price as the other—freight, cartage and commission for selling, besides gaining the ill will of wholesaler, retailer and consumer. We know large apple dealers in this city who are determined to have nothing to do with barrels less than the legal size, and as farmers and country dealers are now having their barrels made for the next crop, they may as well take a hint.

### SOWING GRAIN.

Mr. David Whyborn, Mexico, Oswego county, N. Y.—I wish to state some objections to Mr. Smith's " true principle of broadcast sowing." I object to throwing the seed all one way in a strong wind, from the fact that the wind takes the seed as soon as delivered from the hand and carries it too much in a straight, narrow line, thereby leaving a space between each handful without any, or with very little seed. I admit it would not be so visible to a person walking on the margin of the lot, as if there were long strips of land left without seed in the direction that the sower traveled; but I question whether there would not be more land left unsowed. I object to choosing a strong wind to sow in, any way. It makes it harder work, and if the ground, when plowed, was laid in lands, say from east to west, and when ready to sow the wind should blow from either of those quarters, in order to have the advantage of that wind so as to spread wider at a cast, the targets would have to be placed north and south and sown in that direction, consequently one would have to harrow across the lands or wait until the lot is sown. I object to sowing from a basket or pail, because the weight of the seed is at the side of the sower. To balance himself he leans in the opposite direction, which deprives him of a portion of his power to spread the seed, and it makes his back ache. After forty years experience, I believe a better principle of broadcast sowing is to have an oblong box with a hollow in one side to fit the body; carry the box directly in front, fix it there with two bands, one on each shoulder; then the seedsman can walk upright and have both arms at liberty to use as required. When entering the lot to sow the seed, he either knows or inquires which way it needs to be harrowed, and commences to sow in that direction, using both hands at the same time—that is, filling the left hand at the same time that he empties his right hand, and *vice versa;* and whether there is a perfect calm or a strong wind blowing from north, south, east or west, if he does not try to cover too wide a space, and has judgment enough to give the greater force to that arm that has to deliver its seed in opposition to the wind, the grain will always come up even. As to how wide can be sown at a cast, depends much on the kind of grain or seed, as heavy seed will spread easier than light. As to how many acres a man will sow in a day, will depend on the strength, durability and perseverance of the sower, and the state the land is in to travel on, &c. A man that can sow fifty acres to grain in one day (say ten hours), using only one hand for that purpose, the other being employed in driving a team, must have a hand capable of holding more at a time than mine.

### SHRINKING OF WOOL.

Mr. John W. Nimar, Springfield, Ohio.—For several years I have taken a portion of my wool to the factory to be worked into full cloth, satinet, flannel, and stocking yarn. My wool is of good and fine quality, washed on the sheep, free from coarse dirt and burrs;

in return I sometimes get one-half, sometimes a little more. Thinking all was not right, I concluded to put the matter to a test trial. I took two bunches of wool to the factory last year, they weighed each forty-three pounds; one was made into satinet (cotton one way); in return I got thirty-one and a half yards, not quite three quarters wide, and weighing twenty-one and a half pounds with the cotton included. Five pounds off for cotton would leave me sixteen and a half pounds of wool in the cloth, for forty-three pounds of wool. The other bunch I got carded in rolls; it lost nothing by weight in carding. My wife and hired girl spun it into yarn, and a neighbor man wove it into flannel, which made sixty-two square yards, weighing thirty-four pounds when washed and colored, no cotton in it. I then cut from it thirteen yards and got it fulled to cloth, which made ten and a half yards. Suppose the sixty-two yards to full up one-fourth, it would leave forty-six and a half yards, all wool. The difference was so great, I required the manufacturer to make up the loss—which he did. One pound of good clean wool ought to make one yard of cloth, three-quarters wide, all wool, weighing twelve and three-quarter ounces; and if you fail to get that, I think a screw gets loose somewhere; a turn or two might help it some. Can I hear from others on this subject?

Mr. R. W. McGaren, Coburg, C. W.—On a lot of 5,000 pounds Michigan wool, medium quality, the loss by scouring alone was forty-six and a half per cent; 5,000 pounds unwashed Cape, sixty-five per cent; 5,000 pounds Canada coarse wool (Leicester and Cotswold), fifteen per cent. That is a fair average. Sargent's wool-washing machine would have made it cleaner still.

### WOOL FROM INDIANA.

Mr. Nelson Newton, Orland, Indiana, sends a specimen of wool raised by a neighbor of his, and asks the opinion of the Club whether it is a good combing wool.

Mr. John F. Greene, an old wool merchant of this city, being present, says it is a very superior combing wool, A No. 1, and will make yarn of the best quality.

### INQUIRY ABOUT GRASS.

Mr. R. G. Beattie, McIndos Falls, Vt.—Will turning the sod of a stiff clay soil nicely after haying, and harrowing in a good coat of manure and seeding to timothy next April, be a success, and will there be a good crop the coming season? Which is best for fodder, Hungarian grass or oats?

Mr. N. C. Meeker.—In many places timothy is sown in the fall, and with turnips. Hay ought not to be cut the next year. Don't be in too much hurry. Hungarian grass has not met with much approbation.

### TENNESSEE AND NEW JERSEY.

Mr. A. J. Aldrich, Nunda Station, Livingston county, N. Y., writes to the Club: "Will you tell me through the Club reports which part of Tennessee would be best for a young man to locate in who has about $1,200 cash. I wish to buy 100 acres of land with some improvements and good soil. I am a farmer, have been with Phil. Sheridan through the war, or three years of it. Do you think the Tennesseans will fellowship me?"

Mr. Horace Greeley.—East Tennessee is the only part in that State wherein a soldier would be welcomed by the people. The mountain lands there are well adapted for grazing, and also for grain growing, and may be purchased at very low rates.

Mr. Solon Robinson.—I have no doubt that with $1,200 a man could move to Tennessee, buy a farm, and locate his family comfortably.

Mr. W. B. Peck.—Men going to new countries must expect to endure great hardship. This is the experience of early settlers in the west.

Mr. S. B. Nichols, Hammonton, N. J.—If men wish to buy land they can have it for $10 or $15 per acre, and have four years' time to pay for it, in the State of New Jersey, within 100 miles of New York.

Mr. Horace Greeley.—This country has been brought out of the wilderness by men who went into the woods with less than $100 per family. This, however, has been accomplished by hard work. If men love to drink whiskey, and idle about groceries and taverns, they will be pushed off by more thrifty people, who are industrious and economical. It is now a less difficult task to go into the woods and make farms than ever before. It seems easier to begin life in the prairies, yet the farmers who go into the forests are, at the end of twenty years, much more comfortably and advantageously situated. At first it is much harder to go out into the timber with little else than an axe, yet after the work is accomplished the condition of the people is better in every repect. The State of Michigan is an example of this fact, and nowhere on the prairies do we find such hardy, well-grounded and thrifty settlements as are those located in the timber country.

Mr. Solon Robinson.—I have considerable experience in prairie life. Forty years ago I went into the back woods of Indiana with an axe on my shoulder. Soon after I had settled in the woods, a young man came to me to earn eight dollars. He said he wanted to get married, and wished the money to set up housekeeping. Now he is a comfortable farmer. Later, I went to the prairies, and on this place an Irishman came to me and said he had pawned his luggage for something to eat. I employed him, and in a few years he was an independent farmer.

Mr. Nichols.—A gentleman went to Hammonton, N. J., in 1860, and got privilege to work ten acres. He is now worth $10,000, and made it on the ten acres. His crops were small fruits. He is a hard worker, and has raised a family to industry. Hammonton is 100 miles from New York, and 30 from Philadelphia. In the State of New Jersey there are thousands of acres available as these for such experiments and results.

### FRUIT CULTURE.

Mr. Wm. S. Carpenter.—Fruit growers are apt to depend mostly on the strawberry, which rapidly exhausts the soil. Other fruits should receive their attention. The currant and cherry are fast coming into use, and are most excellent table fruits, They do not exhaust the soil as does the strawberry, are cheaper, and are more easily cultivated.

The Chairman.—Do you believe that the quality of the soil cannot be kept up by the application of ashes, &c.?

Mr. Wm. S. Carpenter.—No, I don't think it can.

Mr. Horace Greeley.—Dr. Hexamer went up into Westchester and began the cultivation of strawberries. He first took off the stone and prepared the soils, then fertilized and raised a crop of potatoes. He then planted strawberries. The first year he obtained a medium crop, the second year a full crop, and the third a medium, and in the four years he realized $400 per acre. He then turned down the soil and began anew, thus always renewing his strawberries after the third crop.

Mr. S. B. Nichols.—Strawberries would do well six years in New Jersey. Blackberries seem to be severer on the soil.

Mr. S. Moulton.—In the soil are certain mineral and vegetable properties upon which plants feed. When these shall be exhausted the plant will no longer flourish. This is true of all plants. The point therefore to be investigated is, what are these elements, and how may they be replaced when exhausted? This science teaches, and this Club should develop these facts for the use of the public.

Mr. Horace Greeley.—We are a great way off from this degree of knowledge. Agricultural chemistry does not tell us just precisely what elements have been extracted from the soil by any particular crop, and precisely how to replace them. One hundred years hence these things may be possible. Ten years ago I could raise a good crop of peaches in Westchester county, but now it was impossible either on the same or on adjoining grounds. The whole neighborhood has become unfitted for peach growing.

Dr. Isaac P. Trimble, New Jersey.—I know a man of the third generation of peach growers. He purchased a farm of 100 acres and planted the whole in peaches. He found that a peach orchard in the neighborhood would last twelve years, and after that no peaches could be procured. "The yellows" is a disease not understood, but destroys young orchards. Peaches seem to be a migratory crop, and hence peach growers are continually moving into new and hitherto untried districts.

## HONEY.

Mr. E. G. Holcomb, Brasher Iron Works, St. Lawrence county, N. Y.—For the information of the readers of the Club reports, I will give my plan of having surplus honey. I tried frames in small boxes, putting seven in a box; those all weighed twelve or fourteen pounds, and according as filled did very well, only sometimes the bees would fill one in such shape that it could not be got out short of tearing the box to pieces. The difficulty was in their building the combs too thick either at top or bottom or one end. This was wholly obviated by making the frames like a bureau drawer, with the ends as wide as the top, the bottom piece a little narrower; and to admit the bees, a groove was cut with a saw near one edge of the end pieces on the inside, and thin pieces slipped into this groove for a back to the frame, using spaces three-eighths of an inch in width for the bees to go through. This back forming a division between the combs, causing them to be built even and straight. Mine hold just two pounds each, and are seven and one-half inches long, six and one-half inches high, top and ends one and three-eighths inches wide, bottom one inch wide, ends three-sixteenths, top and bottom one-fourth of an inch thick, strips for back one and three-fourths wide, one-sixteenth thick, put together with finishing nails. They are certainly very nice for family use. as each frame full fills a large plate, and is plenty for a common table full, and there is no muss and daub as there is when taking from a box. These frames can be used on frame hives by setting them crosswise of the frames in the hives, and resting directly on them. I put twenty-two on each of my frame hives, and the bees will fill them quicker than boxes, whether of glass or wood. I don't know of any patent on them.

### BEE CULTURE.

Mr. T. F. Bingham, Gowanda, Cattaraugus, N. Y., exhibited a bee hive compound in its structure, so that any size may be secured. Mr. Bingham gave a very interesting talk on the subject of bee culture. A good bee hive has but three really essential requisites: It must winter bees safely in the open air, have suitable and sufficient capacity for storing surplus honey and giving perfect control to every comb. The hive is easily packed, triangular in form, and having a sharp top, in which the winter stores are kept warm by the heat of the bees, there is no possibility of starvation or freezing so long as honey remains in the hive. Artificial swarms may be produced by division, or queens reared with ease and certainty.

Dr. J. E. Snodgrass.—We are all interested in the subject of the bee, and, therefore, moved that Mr. Bingham be invited to talk half an hour on the subject of bee culture at some future meeting of this Club. The motion was agreed to.

### OLCOTT'S RHODE ISLAND SWEET CORN.

The Secretary reports that the whole of this celebrated sweet corn has been sent out, and it is believed that no corn has ever had such a wide dissemination. It has been sent to nearly every State in the Union. Two barrels have been sent by mail.

### HOW TO PRESERVE BUTTER.

Mr. E. P. Wright, Durham, Greene county, N. Y.—Procure good white oak firkins that are perfectly brine tight, take out the head, first making a small hole, say quarter of an inch in size, then fill it with cold water; let it stand twenty-four hours before you are ready to use it, then rub, while wet, thoroughly, with fine salt; fill your firkin as soon as possible. Your firkin should be of such a size that one can readily be filled in a week or ten days with sweet butter, to within half an inch of the head, then place over it a clean cloth, and fill the space with coarse salt, put in the head, then fill with strong brine, previously made of coarse salt, and stop it up. Butter packed in this way and kept in a cool place, will be as sweet in one year as when first made. I never knew it to fail.

### DO KINGBIRDS EAT BEES?

Mr. Nathan Moseley, Good Ground, Suffolk county, N. Y.—I wish to exonerate the kingbirds from the charge of eating honey bees. Last summer I set a hive within twelve feet of my house, with a determination to watch the kingbirds. Three pair of them built their nests within fifteen rods of the hive. I perceived no sign of the birds eating bees until the middle of June; then my suspicions became very strong that they were eating bees. Accordingly, one afternoon about five o'clock, when the kingbirds are most busy in capturing food, I shot three of them and cut them open, and found nothing to correspond with a honey bee. The insects they had fed on last were not more than half the size of a bee. Judging from the size of their heads and legs, I gave up my ill opinion of the kingbirds, until the month of September, when a kingbird took up his feeding ground within three yards of a rugged swarm. I watched him occasionally for three days, and became very much of the opinion that he fed on the bees, so I put him to the test of an examination; but before doing so I saw him capture what I thought was three honey bees; on cutting him open I found nothing that would compare perfectly with a honey bee; the insect the bird fed on was of a lighter color than a bee, which I think was ants of a flying species. All the food I found in this bird's maw would not make the bulk of a honey bee. After the examination, I said to my wife I would not shoot any more kingbirds for their being accused of eating bees.

### OSAGE ORANGE HEDGE.

Mr. John F. Zerby, Concord, Ill., sends the Club the following method for making an osage orange hedge fence that will turn any kind of stock: Prepare the ground in the fall, if possible, by plowing at least ten inches deep; or if delayed till spring, subsoil as deep as possible; then run a furrow eight inches deep, and set the plants four inches apart; cover all but two buds, being careful always to cover all the yellow part or root; then cultivate as corn until the third spring, and then plash by cutting the plants half off as close to the ground as possible, and laying the bush back exactly on the row, which will make a fence that will turn any kind of stock. About the 1st of June and 1st of October is the proper time to trim a hedge fence, which ought to be done twice a year, after it is three years old, to keep it at its proper height.

### BERRY PRESS.

Mr. Thomas Bell, Harlem, N. Y., exhibited a berry press, by the use of which the juice may be readily expressed from any sort of fruit berries. It is simply a tin or metalic cylinder with a piston forced down by a screw.

### CANE MILL.

Mr. Daniel Bonsall, Salem, Ohio, exhibited a wooden cane mill for the expression of juice from sorghum and sugar cane, also from beets and apples. It requires about one horse power to operate it, and costs fifty dollars.

Mr. Wm. S. Carpenter.—This sugar production is becoming a most important question, and anything bearing on it is interesting.

Mr. Solon Robinson.—We know that wooden mills will do well, are cheaper, and more durable. This, it seems to me, is a valuable invention.

### BUILDING MATERIAL.

Mr. S. T. Fowler, Brooklyn, exhibited a new building material composed of sand, lime and saw dust; two parts of saw dust, and one of lime, cemented, and tinted any durable color; costing about twelve cents per cubic foot, and said to be durable and fire proof.

Mr. Solon Robinson.—The quality of cement is greatly affected by season and atmosphere. Exposure through the summer before grinding greatly improves it.

### GAUGE FOR HOLDING THE BARS OF REAPING AND MOWING MACHINES.

Mr. Thomas Brett, Geneva, Ohio, exhibited a gauge for holding the bars of mowing and reaping machines in grinding, and explained the manner of using it.

Mr. Wm. S. Carpenter.—I regard this as a valuable invention, and it overcomes the difficulty in grinding a proper level on the knives.

### SEAT FOR REAPERS AND MOWERS.

Mr. Brett also exhibited a seat for the driver, which would prevent accident in mowing and reaping by machines.

Mr. Wm. S. Carpenter.—This is undoubtedly a good invention—labor saving and life preserving. On this seat, it seems to me, riding on a mowing machine might be a pleasure.

### FRUIT-TREE PROTECTOR.

Mr. D. Mendenhall, Fairfield, Iowa.—This is a rubber collar, including a vessel for holding liquid, and so arranged that it will be difficult for insects to crawl up a tree, and if they should cross the collar they would be drowned.

Dr. Isaac P. Trimble.—This certainly is an improvement on the metallic kind. But it cannot be wholly a protection. More knowledge is needed on the nature of insects. In Gramercy park the city spent several hundred dollars in tree protectors, but it did no good because the eggs of the insects which did the damage were laid on the branches of the trees. As regards the great enemy of fruit-trees in New England, the canker-worm, this device will be a remedy only in part. Some have been so discouraged as to cut down their trees. For the case is this: the female cannot fly; certainly, then, if she can be prevented from crawling up a tree, the tree will be saved; but it has been discovered that the male will take her on his back in the night and fly with her into the tree.

Mr. Simeon Baldwin, New Haven.—In our city the lead protectors have been found useful; in putting them on, the tree is scraped smooth, and the cup filled with oil.

Mr. N. C. Meeker.—In Cleveland, Ohio, they have paid great attention to ornamental fruit trees—perhaps more than in any other city. They have most beautiful shaded avenues, and we have a gentleman present who has been interested in these improvements, both while a citizen and a member of Congress. The Club would be glad to hear from him I refer to.

Mr. J. W. Allen.—Formerly insects did some damage, but they have disappeared, perhaps because we have so many trees. Our climate is favorable for the growth of trees, also for all kinds of fruit. We produce grapes largely, and excel Cincinnati in peach culture. This we ascribe to the influence of the waters of Lake Erie.

### HUTCHINS' REVOLVING CHURN DASHER.

Mr. A. B. Hutchins, Patchogue, L. I.—This is quite similar to the screw of a propeller, and it was claimed superior to all others. It was tried in a can of water.

Mr. Solon Robinson.—I have not the least doubt but it is equal to the common dasher.

Mr. N. C. Meeker.—We will never get butter by churning that water. If the dasher can be sent to some place where they have cream, and tried, then we may know more about it.

### PLUMMER'S ADJUSTABLE HAND HOE.

This has a moveable joint in the gooseneck, worked with a wrench and fastened with a nut, so as to give the blade any required angle. Several expressed favorable opinions, but preferred to see it work before deciding.

### STAFFORD'S HAY PRESS.

This has some new features, the levers are ingeniously arranged, and on the whole it seemed important. As this was only a model, Mr. Stafford proposed that a committee be appointed to examine a working press, which was agreed to.

### FORK SPADE.

Mr. C. Taber, Brooklyn, L. I.—Those who have never used any other than the old blade spade do not know the superiority of the fork. The farmer frequently turns over a mass without breaking or disturbing the centre, while the tines of the latter crumble it through and through. The four-tined spade, or potato fork, is the best, and after a trial the old fashioned kind will be laid aside or kept for digging post holes. The lightness of the fork is also in its favor. Adjourned.

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## May 14, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### TO KEEP BUTTER IN SUMMER.

Mr. D. Hopkins, Orwell, Vt., communicates the following to keep butter in the summer season: Pack it in well soaked tubs or firkins; put a little damp salt in the bottom and place it in a cool dry cellar on a bench of wood eighteen inches from the cellar bottom, and the same from the wall. Stone or earthenware does not keep butter well, as the moisture from the surrounding atmosphere in warm weather, condenses on such vessels and soon affects the butter. Put no salt on or between the layers. Fill to within half an inch of the top, and place a clean wet cloth over the butter, and pack the edges down with a knife, and then spread thin wet salt over the cloth. Having made and dealt in butter for some time, the above mode of packing and keeping butter will be useful to many, and cause a smile of delight to the buyer.

### SIZE OF TREES FOR ORCHARDS.

I find apple trees four or five years old from the grafting, are better to set out for an orchard than younger trees. Such have more strength of wood and bark, and stand transplanting and acclimating in our cold climate better than younger trees. A first class tree should have some healthy fibrous roots, and I had rather have medium height and stocky than tall and slender. It makes no difference where or how they are raised in the nursery provided they are healthy. I had rather cultivate for two or three years with corn than any other crop. The corn helps to shade the bodies of the trees from the hot sun until the tops grow to shade themselves. Early in the spring, before the buds start much, wash the bodies and the limbs with equal quantities of soft soap and water. It will kill most of the vermin that infest apple trees, and give them a smooth, healthy look. It is sure to kill bark lice, which I find nothing will kill without killing the leaves, if applied after the leaves have grown.

### GYPSUM OR PLASTER.

Mr. J. D. Conklin, Locke, N. Y.—The value of plaster is now so very generally conceded, that to prove its value is not necessary—only its best mode of application. First, it should not be sown after the sun has got up enough to produce a strong evaporation of the dews, as then a large portion of the fertilizing properties would be carried off by the attraction of the sun, with the hydrogen gases, and especially so if the plaster is ground fine, as it always should be to produce the best results. Second, perhaps the best time would be after sunset on a still evening, when the dew is falling fast and pressing rapidly the fine particles of plaster to the earth, which at this time of day acts as a condenser. But when a large quantity is to be sown, it will be necessary to vary the rule, but a falling atmosphere is desirable.

### NATURAL GAS.

Mr. E. Pratt, Geneva, Ashtabula county, Ohio.—I wish to inqure of you the practicability of burning gas for lights in my house. I have a spring 200 feet from my house that bubbles gas all the time, and has, to my knowledge, for thirty years. I have often turned a barrel bottom side up over it, and punched an awl hole through the bottom, set it on fire, and it would burn for hours at a time. What hinders me from building a tank and bringing it to my house?

What size should the pipe be? There are a number of such springs in our township.

Mr. Solon Robinson.—Let the writer go to Fredonia where such gas is used, and learn from the experience of others.

### GRAPE GROWING IN ILLINOIS.

Mr. N. W. Bliss, Warsaw, Ill., sends the following statement of the operations of Mr. George Morlot in vine and fruit culture: "Mr. Morlot is a native of, and a late emigrant from 'sunny France.' His place lies some twelve miles east of Warsaw, on the waters of Bear creek, and was formerly known as the 'Carnes place,' near Sylvan Dale, which is his postoffice. He has sixteen acres in vineyard, some 12,000 vines, one-third Catawba, a little over one-third Concord, something less than one-third Clinton. Has a few vines each of Delaware, Norton's Virginia, Diana, and Madeira, ten acres in bearing—balance planted in 1866; last season he raised 40,000 plants which he sold to be planted at Arlington Heights, Va. His vines are laid down and carefully covered. His trellises of wire are in first rate order. He has many European trees growing, of the apple, pear, cherry, plum, and quince. It is curious to observe the great difference there is in the habitude of different varieties of the same species of these foreign trees, and especially in the readiness or want of readiness which they exhibit in becoming acclimated; for instance, he will show you pear trees of equal age and original vigor of plants, after treatment which has been the same in every respect, some of which have grown vigorously and are now full of fruit buds, while others, standing next them in the row, have made scarcely any growth at all. The results of the experiments, Mr. Morlot is trying with European trees, will be of great interest to the country."

### SPRING WHEAT.

Mr. Armine Pickett, Weelaunee, Wis.—I see by the reports of the Club an intimation that the Club would like more information about raising spring wheat in the West. Wisconsin, Minnesota, some parts of Iowa, and the northern part of Illinois is the region in which spring wheat is principally grown. It is sown from the middle of March to the 10th of May. It is not necessary that it should be frozen after being sown to produce a good crop. Success depends upon the nature of the season; sometimes the late sowed does the best. The best spring wheat is grown in Wisconsin and Minnesota, and perhaps some parts of Iowa. And this is the source of supply of the best spring wheat to the Chicago market. The kinds now principally grown are the Conolly Club, Fife and Rio Grande—the two former are club, the latter is bearded. The crop the past season was not generally first quality, owing to the extreme heat when ripening. It does not seem to make much difference about the time of ripening, whether sown late or early. The reason it is raised instead of winter wheat is on account of failure of snow in the winter to protect the winter wheat; snow being so uncertain, the raising of winter wheat is pretty much abandoned.

The great question of interest to the whole country is the spread or suppression of the Canada thistle. Men will spend their time and money at all kinds of shows and exhibitions, and stand or sleep, and let this curse from heaven spread over the whole land. If it is not checked in its progress, it will be but a short time before the producers of wheat will be driven from the great wheat fields of the West as Adam was driven from the garden in the East.

### THE HONEY BEE.

The regular subject was then taken up. Mr. T. F. Bingham, Gowanda, Cattaraugus county, N. Y., having been requested at the last meeting of the Club to read a paper on the honey bee, was now called to the stand. In introducing his paper, Mr. Bingham said a thorough understanding of its contents would enable any intelligent person to keep bees with profit.

While agriculture in the United States is among the neglected branches of rural economy, the time is not far distant when, like Germany, Switzerland and Prussia, it will become a source of national revenue. No branch of rural employment presents so wide, profitable and charming a field for the ladies of our country as bee keeping. Many have accepted it, and success attends them.

To possess a hive that will winter safely an average swarm of bees, if well supplied with honey, giving perfect control to every comb, and furnishing suitable spare honey facilities, is to have taken the first step in profitable bee culture. While it is advisable that every bee keeper should understand every point in the natural history of his subjects, it is not essential that he should be familiar with every minute detail. But to succeed in bee keeping, one should know that there is but one mother bee in every perfect swarm, and that she accompanies the first swarm in all cases. All after-swarms contain one or more unimpregnated queens. This, in connection with the fact that every young queen leaves her hive when about five days old to meet the drones, and is liable to be destroyed by birds, or in entering the wrong hive on her return, enables him to guard against the most common and destructive accident incident to bee keeping. Any number of swarms may be united within three days after the swarming with perfect safety. At no other time can any two colonies be united without the certain destruction of every bee belonging to one of the queens, unless one of the colonies has been queenless at least twenty-four hours. A queenless stock may be united with one having a queen at any time. Bees confined by stress of weather or otherwise, four or five days, may be moved to any part of an apiary, and if not permitted to fly until noon on a warm, pleasant day, nearly all will return. These facts will enable two or more stocks of bees to be united at any time. The loss of a queen in the spring or fall, or insufficient stores for bees to winter safely, may render such union very desirable. A strange queen may be given to any stock not having one, by confining her in a wire cage in the middle of the hive to which she is to be given, three days. If the hive is then closed and drummed vigorously for twenty minutes, and the queen let loose among the bees, she will be kindly received. This will enable the change or introduction of queens when for any purpose it is desirable. One other point and you are in possession of the fundamental principles on which practical bee keeping is based. Bees cannot be taught anything, but when frightened they rush to the unsealed honey and commence filling their honey-sacks. While thus engaged, or when their sacks are full, they never sting unless pinched. Drumming as above described, or smoke injected into the entrance, will accomplish this, after which the hive may be opened and the bees handled with perfect safety. The hive I use is of triangular form, one corner pointing upward. The heat generated by the bees is concentrated directly in the top, where the winter supplies are stored. This enables the bees to obtain food with absolute certainty so long as honey remains in the hive. It accommodates a great number of shallow spare honey boxes in close proximity to the brood, and the angle of the frames secures the building of straight combs.

The hive opens on either side, rendering examination very simple and easy. The outside case is a rough square box, to cover the boxes in summer, and serve in packing the hive in winter for the protection of the bees, and is covered with a lid. It is all the bee house needed at any season in any climate. I sell the eight boxes and hive for two dollars. I believe it is the best, cheapest and most convenient hive in use. From a wide range of observation and experiments, it appears that if the inside of a bee hive is kept at about the same temperature as the air it contains, no condensation takes place, and the hive and bees remain perfectly dry. The old style straw hive is a good illustration of the fact, and its effect in wintering bees freely sustains me in the belief that this hive will winter bees even better than a straw hive, which in form and principle it resembles. I have used hives constructed on this principle four years. I have opened them for experiments and the inspection of friends. When mercury indicated ten degrees, and five hours previous had been fourteen below zero, I have found the boards above the bees dry, free from frost, and the bees nimble and on the defensive. In the last German Apiarian Convention, Mr. Tziertzone, the greatest of German apiarians, said that while science and invention had revolutionized bee keeping, no real advancement had been made in wintering bees. "How to winter bees being the great remaining unsolved problem in practical apiculture." My experiments with the hive before you, the past winter, justify me in the belief that this hive will meet the want above expressed—a want which, if it can be met, will add millions of dollars to the national wealth. Last January, when the mercury was at six degrees below zero, a thermometer between the shavings and main hive indicated thirty-four degrees above; that, too, with an open entrance on each side, twenty-one inches long, or equal to a hole four inches square. April 29, with the mercury at twenty-five degrees, a thermometer, placed as before, stood fifty-nine degrees. By this you will see it will require cold weather to produce frost in this hive. On a pleasant day in October, when but few bees are on the wing, all my hives containing young queens are opened, and the tip of one wing on each queen is shortened about an eighth of an inch with scissors, and returned to the hive. A few days later, on a colder day, all my hives are turned over, and a careful examination of the bees and honey made. Those having average clusters of bees and honey are considered worthy of wintering. Those having small clusters of bees are treated to a little smoke, that their music may be heard. If a wild, shrill cry is heard, and great confusion possesses the hive, they are marked queenless. The next small cluster is treated the same way, but instead of the wild cry and confusion, a low, dull hum, and idle flapping of wings is heard, and in a moment all is still. The latter has a queen, but too few bees to winter safely. The value of the two is the honey the hives contain. The queenless hive is at once opened, and the bees brushed in with the others, and the entrance closed. By this operation I have a fine swarm to winter, and a full set of frames and honey. All good stocks of bees scantily supplied with honey now receive a full frame in exchange for an empty one, and are put in fine wintering condition. The hives are now thoroughly packed, each hive receiving two bushels of planing mill shavings. Nothing more can be done for perhaps three months. Should a thaw occur, the dead bees on the bottom boards are removed with a wire hook. By this timely aid no bees will be lost on the snow. When the weather becomes warm in March, two blocks are laid on each side of the hive, leaving a small opening between them for the passage of the bees. In April, a few hives are examined, which in the fall had the least honey. If they still have enough, all others are presumed to have, and no further examinations are made. At this season the bees are searching for pollen whenever the weather permits, but little is to be found. A large flat box is set in a sunny place, away from the rain and wind as much as possible, and about half its bottom covered with rye flour. The bees soon find it, and after saturating small particles of flour with honey, they are carried on their legs to the hive the same as pollen gathered from flowers. It undoubtedly answers the same purpose.

In May, a few populous hives are given one or more boxes, as they seem to need. This is continued through the apiary as long as the honey season lasts. When a box is full it is removed, if the colony has as many partially filled ones as they are likely to need. If not, it is allowed to remain. No idleness is allowed for want of room. Nothing to obtain honey from is the only pardonable excuse for idleness in an apiary. All boxes are removed as soon as the season is passed, sealed and packed in a dry upper room. No box is ever put on a hive which does not contain three pieces of clean drone comb, about an inch square, in its upper corner, the web running parallel to the glass. The bees occupy them sooner, and straight combs are secured. The combs are obtained early in the season from hives having such combs. In the boxes they are valuable, in the hives worse than useless, producing only drones. All my queens having clipt wings, no first swarms ever light on trees. When a swarm issues, the queen falls in front of the hive, and is at once caged. As soon as the bees are circling in the air, the entrances are closed with sticks previousty fitted, and the caged queen laid on the entrance. The bees quickly return. Unable to enter the hive, and finding their queen, they cluster upon her. A hive is now placed near them, and a few bees scooped in front of it. As soon as they are moving toward the hive steadily, the cage is opened, and the queen placed among those entering the hive. In a few moments the hive is moved where it is to stand. The entrances to the old hive are opened, and all is over; no excitement; no ladder needed; no trees injured; no first swarm last; and last, but not least, the swarm has been hived by a lady. When a second swarm issues, it is put in a box having a loose cover, until the one from which it came can be opened and its royal cells removed. Then it is returned to the patent hive. No more swarms issue, and a fine lot of box honey is obtained. My hives stand on stakes about a foot from the ground, and from five to ten feet apart. They face every way, and are scattered over an eighth of an acre in the most sublime confusion.

Bees, unlike the correspondents of the Farmers' Club, when magnetized by the spirit of emigration, do not ask this or any other august body whether it is better to go to Vineland or Minnesota. But, by a republican vote, without caucus or lobby, a day is fixed when, Providence permitting, they will take up their line of march.

Preliminary arrangements are promptly made for the welfare of those too young to go or otherwise inclined to remain, and the general labors of the time suspended. For a few days the work of preparation goes quietly but steadily on, Orders are received that every female soldier take eight pieces of prepared honeycomb, three days' rations, one round of fixed ammunition, and form into line! Great activity prevails! Orders are quickly passed. Forward, march! but a moment passes, and the grand army is in motion.

The queen lives to be about three or four years old. The workers are females incapable of impregnation. They are provided with honey sacks for carrying honey, and baskets on their legs for carrying pollen, an instrument of defence, which is both a torpedo and a ram, considered by many a formidable weapon, either offensive or defensive. The workers do all the work of the hive. The queen lays all the eggs. There are two kinds of eggs, one producing workers, the other only drones. This, to a certain extent, is controlled by the queen. Any eggs deposited in the drone cells which are the larger cells in the hive, will invariably produce drones, while those which are deposited in the worker cells produce workers or queens, accordingly as they are treated. For the production of queens, which are only required at swarming time or when the queen is lost, the workers seem to make special provision. The queen is reared from the larvæ the size of a pin's head, about three days old. The cells are cut back about this larvæ, and a larger wall built up around them. A thick, creamy, acid substance is placed in the bottom of the cell immediately around the young worm; and as the worm grows in size the wall is extended, and more food is deposited in the cell until she seems to float in a bed of cream. On the eighth day from the laying of the egg, the cell is sealed over; eight days after, a perfect queen emerges. Within fifteen minutes from that time she goes around to any other cells containing other queens nearly as old as she is, and destroys them by tearing open the cells at the base and stinging the occupant. He had known them to destroy five cells in half an hour. There are 700 to 3,000 eggs per day. The queen is only reared in the hive when the old queen is absent; there is never but one queen in a hive. The combs are seldom found with eggs on one side; but most invariably having eggs on both sides. There are no drones or male bees at this season of the year; none in the hive except at swarming time. They usually begin to appear in the middle or fore part of May. They are only valuable in impregnating young queens, which occurs when the queen is about five months old. The proper mode of handling bees is mainly dependent upon the person handling them. I think there is no teaching bees anything. I find that after I have opened the hive twenty times in succession they still need the same treatment.

Mr. Solon Robinson.—The principles announced by Mr. Bingham are undoubtedly correct. But it should be known that bees do not flourish in all parts of the country; perhaps this is owing to an insufficiency of proper pasturage.

Dr. Isaac P. Trimble, of New Jersey, said that he thought bees were capable of being taught. A gentleman in New Jersey had invented an apparatus to prevent the bee moth from coming into the hive. It consisted of a hanging gateway, which closed as soon as the bee passed through. One permitted the bee to pass into the hive, another permitted it to pass out, and the inventor had shown him how he taught the bees to manage the opening and shutting of that door. This proved that bees could be taught.

On motion, Mr. Bingham was requested to furnish a copy of his paper for the Transactions of the Institute.

### BEES AND BEE PASTURAGE.

Mr. Thomas Sanders, Afton, N. Y.—I see among the many inquiries in the Farmers' Club, an inquiry for the best bee pasture. After many years of experience, I find the only reliable pasture for bees is white clover, which is easily and cheaply produced by the application of one bushel of plaster to the acre, applied each and every year, on almost any soil except wet or clay soils. As the country is being cleared of its original forests, and all the wild and waste places are brought into cultivation, and in consequence the country more frosty, the food for bees has become greatly lessened, requiring of the bee husbandman more care to produce successfully bees and honey than when the country was new. No man should expect to raise bees successfully now, and winter his bees out doors or in the open shed, where the bees are affected by every south wind or warm sunny days in winter. The best method of wintering bees, in my opinion, is to build a stone house of the size requisite for all the family of bees, well laid up with mortar, should be tight and dry, and when the door is closed, perfectly dark. No floor over head, which gives good ventilation. The bees to be placed on shelves, one above the other, the first to be raised from the bottom board, and holes made near the top to give plenty of air, but no holes sufficiently large for mice to get in. The same building can be used for an ash house without inconvenience to the bees.

### CORN AND SEED PLANTER.

Mr. Solon Robinson exhibited one of J. A. Burchard's (Freeport, Ill.) corn and seed planters, and on motion it was referred to him to report on its merits.

### PROPAGATION OF BLACKBERRIES FROM SMALL PIECES OF ROOTS.

Mr. F. K. Phoenix, Bloomington, Ill., showed specimens of well-rooted Kittatiny plants. The method of propagation is such that they are safely planted to the middle of June, can be sent by mail, are cheap, and will bear next year, when they will produce new plants to be set out.

Mr. Wm. S. Carpenter.—We are glad to welcome Mr. Phoenix to our meetings. He is a public benefactor in the way of distributing, at the lowest possible prices, the best and newest varieties of fruits.

### CISTERN REGULATOR.

Mr. Solon Robinson exhibited a simple invention, by George L. Frankenstein, to be attached to a leader for shutting off the water from cisterns until the roof of the house had been thoroughly washed and the dirty water conveyed to the ground.

### DISH WASHER.

Dr. Saxton, Greenpoint, L. I., exhibited an ingenious invention, whereby dishes may be washed without the necessity of putting the hands in hot water.

### FARM AND COTTAGE GATES.

Mr. S. T. Fowler, Greenpoint, L. I., exhibited models of gates, simple and convenient. Adjourned.

## May 21, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### STRAWBERRY SHOW OF FRUIT-GROWERS AT HAMMONTON, N. J.

Mr. S. B. Nichols.—The strawberry show of the fruit-growers of Hammonton, N. J., will be held on the 6th of June. The society have voted that the premiums shall be awarded by a committee appointed by this Club.

On motion, it was resolved that this Club appoint a committee to award the premiums as asked for by the society.

Dr. Trimble added, that the managers of the Raritan and Delaware Bay railroad wished the Club would visit the marl works on the route, which was agreed to.

### BALTIMORE ORIOLE.

Dr. Trimble.—I hold in my hands some green leaves of a plum tree on which caterpillars had formed a nest, but which was destroyed by the bird known as the Baltimore oriole. This shows us how valuable are birds in destroying the insects which prey on fruit.

Mr. N. C. Meeker.—I would inquire of Dr. Trimble whether the oriole will not eat the plums he has saved, when they get ripe? I know he is a great rascal.

Dr. Trimble.—I might answer this question by saying he will not. I know that birds eat fruit, so do men and children.

Mr. Solon Robinson.—And there out west they would have no fruit if it were not for the birds.

Mr. N. C. Meeker.—Often, none with them. This is a subject of some importance. Perhaps things are arranged as well as they can be. We are told that birds prey on insects, while insects prey on other insects. But there are some facts which do not place the birds in a very amiable light. The horticultural society at Alton, Illinois, have thoroughly discussed this subject, and they were entirely agreed that birds do immense damage to many kinds of fruit. In some seasons when their Delawares are nearly ripe, the oriole will go along a trellis and peck into bunches here and there, doing great mischief. Dr. Hull, of Alton, stated that he had nearly lost his crops from this cause. It was estimated that the damage the birds did their fruit two years ago exceeded thousands of dollars. We generally understand that the birds make it impossible to raise cherries around Boston. The question should be, whether we love the birds much or fruit more.

Mr. H. B. Smith.—It is against my principle to kill birds, or to have them killed on my place, and when I plant I consider the birds. Eight years ago, I planted forty cherry trees, thinking that both my family and the birds would have a plenty, but we have never got a pint. I had a quarter of an acre of strawberries in hills, but the birds got them all; then I let them run broadcast, and then we got a few which the birds overlooked. If it could be so arranged, I would like to make an agreement with the birds, to this effect: I will plant, cultivate, pay taxes, and see to everything, if they will give me half.

Mr. R. J. Dodge.—It is true that the birds eat the first, sweetest and best fruit. But when it is plentiful there is enough for both, that is, on our soil, which is favorable for cherries, being the red shale. I have a large sweet cherry tree, which every year bears about five bushels, and the birds eat four of them, while one bushel is left for us, and it is all we want.

Mr. J. R. Sypher stated that, in his father's apple orchard, certain trees were marked for family use, and no boys or men ever picked an apple from them.

The Chairman stated that he has an abundance of cherries every year, on his place in Norwalk, and he has a standing reward of ten dollars offered for the arrest of any person who would dare to kill a bird on his premises. He thinks that his bountiful crop of fruit is attributable to his large number of birds.

### SPRING WHEAT.

Mr. H. G. Neal, Davenport, Iowa.—To one who has been engaged in farming for some fifteen years on the prairies of Iowa, it seems strange that men writing for the public eye should persist in specifying what month, or day of the month, spring wheat should be sown, and the statement "that it should be frozen and thawed out like any winter grain," is simply ridiculous.

In the winter of 1855, I obtained some wheat of the variety known as the Canada Club for seed, it being a comparatively new thing in this country. In conversation with one who had been largely engaged in raising spring wheat, he remarked, "remember that two acres of wheat sowed in March are worth three sowed in April." March proved to be very cold and snowy, the ground was not thawed enough to commence harrowing till the 3d of April, and then there was half an acre in one end of the field covered with a snow-drift three feet deep. Sowed fifteen acres of Red river wheat first, and from the 5th to the 10th sowed 29½ acres with club, which was thrashed in November and marketed in December and January, and weighed 882 bushels, or 30⅓ bushels per acre; this was the third crop on the land.

The spring of 1857 was more backward still. Commenced harrowing for wheat April 27, and finished May 9; breadth of land sown, 73 acres (first crop), yield, 1,600 bushels, or a fraction over 22½ bushels per acre. All of these two crops made No. 1 wheat, and be assured that, after the seeding was finished in the latter case, there was no freezing of the ground until after it was harvested and thrashed. Do not infer from this that I am an advocate of late sowing. Far from it. There is a very simple rule for raising spring wheat, which, if a man follow, he will have no cause to regret; that is, in this latitude and longitude, have your land well plowed in the fall, and as soon after the 10th of March as the frost is out, and the land dry enough, so that the seed may be well covered. "In the morning sow thy seed, and in the evening withhold not thy hand," and you can hardly fail of receiving a fair return for your labor.

### CANNING FRUIT.

Mrs. Martha S. L. Durfee, Covington, Wyoming county, N. Y.—I will give the Club my way, which is less laborious. I pare the peaches and put them in a stone jar, or porcelain kettle, a layer of peaches and a sprinkle of sugar alternately, say from four to six ounces of sugar to one pound of fruit, or enough to sweeten it for the table, and let it stand a day or two before canning, when the sugar so hardens the fruit that it is not likely to cook to pieces, and juice enough is found to require no addition of water. Then put the fruit on the fire to scald in a porcelain kettle, and when it is thoroughly scalded, I wring a cloth out of cold water and spread it on the table four double; rinse out the jars in warm water, and set them on the cloth and fill them with the hot fruit, seal them tight with rubber, wax or anything else, and let them stand on the cloth until the cans are cool, then put them away in a dark, cool place, and the fruit will keep good until you wish to eat it. Perhaps you will say any fool will know the jars would break, filled in this way. I have tried five different kinds of jars, and have never broken one, and have put up peaches, apples, berries, plums, &c., and the fruit has kept as good as when I stood over the hot stove to fill them, and lifted around the great boiler of water. If the fruit is scalded in a kettle, and then put in the jars, we are able to can more fruit in the same jars than if it was put fresh in the jars and scalded in them; and this is an item when there is a dozen in the family to feed.

### PLASTIC SLATE.

The Chairman read a letter from Mr. Eyre, of Trenton, stating that he and others visited Mr. Harrison, of Philadelphia, who was alleged to have put on a plastic slate roof and had it pulled off—when Mr. Harrison said he never had such roof. The original statement, therefore, seems unfounded, and needs explanation.

Mr. N. C. Meeker.—I will state that in conversation with Mr. Sinclair as to the cause why his roof leaked, he said he is convinced that it was put on too thin, for it ran off, and that from that trial he has no knowledge but what plastic slate will make as good a roof as is claimed for it.

### SCIENTIFIC AGRICULTURE.

A long discussion ensued in relation to appointing a committee to investigate scientific principles touching agricultural subjects. Mr. Moulton then presented the following resolution, which was accepted and adopted by a vote of the Club:

"*Resolved*, That the subject of the investigation of the relations of the atmosphere and the soils and their vegetable growths, looking to the discovery of the best natural and artificial manures and nourishment for the different vegetable growths, as strawberries, grapes, &c., as well as cereals, be referred to a committee of five of the members of the Farmers' Club, to consider the matter further, and to recommend the best and most feasible means of action, with leave to report at any time."

The Chairman then named the following individuals as a committee, to report at their pleasure on the foregoing resolution, viz: Stelhier Moulton, Dr. J. V. C. Smith, Prof. S. D. Tillman, Dr. J. C. Snodgrass, J. R. Sypher, Dr. Isaac P. Trimble and S. Edwards Todd.

### IMPROVED PLOW POINTS.

Mr. H. G. Hall, Zanesville, Ohio, exhibited an improved plow point, providing for the renewal of the point and edge of the wing of plowshares, at an expense of not over five cents per point. This was received as an excellent device for keeping plow points sharp. The same man showed a harrow of curious construction, which cannot be described intelligibly without drawings. The teeth of this harrow are made like a curved coulter with the points standing back instead of forward. The upper end of each tooth is round, and turns in a socket in the frame of the harrow. Such teeth cannot clog.

It is a question which must be decided by practice, whether teeth that are constantly glancing and sliding around obstructions will be more effective, in pulverizing the soil, than rigid teeth that move in a direct line through sods and other obstructions.

### FRUIT PICKER.

Mr. John Bally, Deposit, N. Y., exhibited his Excelsior fruit picker, attached to the end of a staff, for taking specimens of fruit from the branches of trees. This picker does not pull the fruit from the branches, but it is so constructed as to cut the stem, without jarring the limb. The knife is attached to a movable jaw, and the cutting edge is provided with a shield to protect the fruit buds from being cut off with the fruit. Among the large number of such devices, for taking one specimen of fruit at a time from the tree, this one appeared to possess an advantage in this important point, of cutting the stem instead of the twig which holds the fruit buds. When the stem is severed the fruit is received in a small sack attached to the end of the pole holding the fruit picker.

### FIBERIZED CONCRETE.

Mr. S. T. Fowler, Greenpoint, L. I., exhibited a block of this article, weighing perhaps a hundred pounds, suitable for building houses. It looked like a block of polished stone, fit to go into a nice house, and each side differed in appearance from the other. It is composed of eight parts of coarse sand, two of sawdust, one of good lime, and one of good cement. The material is suited for roofs, cellars, basement bottoms, ice houses, cistern tops, &c. There is a patent. The members were much interested, but as it is a new article, no opinion was expressed.

### METALLIC COLLAR FOR CHIMNEYS.

Mr. W. H. Kelsey, Red Bank, N. J., exhibited a small model of a roof of a house with chimneys, to show how chimneys can be constructed to prevent water from running down on the inside of the house. A sheet iron, zinc or tin frame is nailed to the roof before the chimney is built, and the upper side of the tin is turned over in a horizontal direction and received in the joints between the courses of the bricks. The device seemed to be an excellent contrivance for that purpose. Adjourned.

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## May 28, 1867.

Mr. NATHAN C. ELY, in the chair. Mr. JOHN W. CHAMBERS, Secretary.

### STRAWBERRY PLANTS FROM FROM VINELAND.

Mr. Charles Williams exhibited a specimen of Vineland field culture of strawberries, which gave the members a high opinion of that region for this fruit.

Mr. Carpenter.—This is quite creditable to Vineland cultivators, and we are pleased with the evidence of what they can do. We are surprised that they should have plants nearly as vigorous as ours.

### FRUIT-PRESERVING HOUSES.

Prof. Nyce, of Cleveland, took the stand and answered several questions on preserving different kinds of fruit. He showed specimens of apples in complete preservation. In his houses it takes six months for an apple fully to decay after it commences, but the cause is original imperfection, while if taken in perfectly sound, they will keep two years. Out of sixteen hundred bushels he does not expect that more than eighty bushels will be lost by June 1, which is only five per cent. Neither peaches or strawberries can be kept, and never will be. Peaches have longitudinal fibers, and in a manner collapse, while being without the protection of a skin, they lose by evaporation of the juice and become hard. He had coated them with oily substances, but in vain.

Mr. Solon Robinson.—A coating of paraffine might answer. This cheap paper, dipped in paraffine, makes just as good a cover for fruit jars as rubber, while its cost is so little that it cannot be estimated.

Prof. Nyce stated that, by packing eggs in charcoal dust, he had kept them in his house nine months, and it was difficult to tell them from fresh eggs. The only difference was in the yolk having shrunk one-twentieth.

Dr. Isaac P. Trimble.—I have watched this business of preserving fruit from its commencement. At Trenton they have a house where the fruit is keeping well.

Mr. Horace Greeley.—How long can you keep grapes?

Prof. Nyce.—I have kept the Catawba till the next crop, but have not succeeded to this extent with any other variety. We keep pears very well at Cleveland, but the fruit grown there is not as good for this purpose as that grown in colder climates. Boston pears will keep as well as apples. When fruit is taken out of our houses, the length of time it will keep will vary according to the heat of the weather. When the mercury is at eighty degrees it will rot in a few days. We do not undertake to work miracles. All we can do is, as it were, to put the fruit to sleep.

Mr. N. C. Meeker.—Eggs are not preserved by oats, they are used to pack them for market.

### SPEAR'S FRUIT SOLUTION.

Mr. Worrall exhibited several cans of fruit preserved by this solution.

This is a preparation put up in third pint bottles, and is claimed to preserve fruit either with or without sugar. A bountiful supply of peaches, cherries, quinces, and plums was passed around among the members, and the ladies were not slighted. The quality of the peaches and quinces was fine, the latter in particular. The plums were not so good. One of the ingredients used is sulphite of soda. The fruit is first heated to a boiling point, when the preparation is added in the proportion of one ounce to eight pounds of fruit.

Mr. J. R. Sypher.—Three years ago my family tried this preparation, and it was much talked about; we varied the quantities, but found it imparted an unpleasant taste to the fruit, while fruit not so treated was satisfactory.

Mr. Spears.—I am glad to hear this report. One will not always succeed. But here is the fruit. It speaks for itself. This material also arrests the fermentation of cider at any point. It will also preserve fresh meat.

A large piece of fresh meat was then exhibited, which was ten days old. Further trials will be had in this direction; the importance of the subject demands it.

Mr. Isaac Hicks, North Hempstead, Long Island, showed some beautiful streaked pippins, which were in an excellent state of preservation; and he thought the kind fully equal to the Rhode Island Greening for eating or cooking. The specimens had been taken from a quantity of apples that were kept in a tight box, all of which were taken out every three weeks, and wiped dry. This treatment seemed to keep them in an excellent condition.

### MARYLAND EMIGRATION.

Prof. Higgins, State Emigrant Agent of Maryland, delivered an interesting address on the advantages this State possesses for industrious men and capitalists seeking homes. The climate is the most delightful in our country, land is cheap, and the large proprietors are willing to sell. With many it is not a question, for they are in debt, and obliged to sell. Northern people are treated courteously, and sometimes better than they deserve. Farms can be had for twenty to thirty and forty dollars an acre. There are various marls which add to the natural fertility of the soil.

Mr. Horace Greeley inquired how extensive the marl beds are. The professor explained explicitly the extent of the beds, and also the value of the marl in various localities of the State. He stated that he was familiar with fields there that would not produce five bushels of wheat per acre, which were made to yield fifteen bushels of excellent grain, simply by the application of a dressing of marl.

Dr. Snodgrass spoke of Maryland, from personal observation, as having many advantages.

### STEAM PLOW.

Mr. J. K. Fisher showed a drawing of a steam plow, and asked the opinion of the Club as to several points. The plan proposed is revolving saws, instead of diggers or plows. He wished there might be concert of action on this subject. All the inventors in this line should unite in a joint interest, and in the event of success, be entitled to share in the rewards accordingly as they may have contributed ideas.

Mr. N. C. Meeker.—For the benefit of the many who are working at steam plows, and who are asking opinions on their models, I would state that in Illinois the Fawks plow once was supposed a complete success. It received a premium of $3,000 from the Illinois Central railroad, and afterward, to perfect it, this company advanced large sums. The first trial was at Centralia; the next at Decatur, and on a farm where real work was to be done. The result was, that it took as many teams and men to haul water and coal as it would have taken to have done all the plowing. More than this, the locomotive sometimes got stuck on wet ground. The whole plan blew up, and after that the locomotive itself blew up.

The Secretary.—It cost the American Institute over $1,000 to have the steam plow exhibited in this city.

Mr. Horace Greeley.—I lost $1,200 by that enterprise myself, but I do not regret it. Steam plowing can be done. It is done now in England. There is an objection to animals; they expend a portion of their strength in getting their feet out of soft or wet ground. I believe that within ten years, land will be plowed twenty inches deep at a cost of one dollar an acre. Work so done will be worth three times more than if performed by animals. The fuel need not be coal, but peat. The vast bodies of New Jersey land will be brought into cultivation, and they cannot be plowed in any other way so well as by steam. Our friend Solon used to say we never would have a perfect mowing machine till it would mow around stumps and stones. We ought to have a steam plow, if for no other purpose than to make us put our land in a better condition for yielding grain. I have got out stones on my farm, in Westchester county, at less cost than to plow around them. Still, we have much land that ought not to be plowed, but which should be reserved for the growth of trees.

Mr. J. R. Sypher.—Mr. Fawks was not the man to carry out the work he undertook. His boiler was not constructed so as to preserve all the forces that can be gathered from steam. Since his efforts, we have greatly improved in the construction of engines.

Mr. Horace Greeley.—I like the plan proposed of having saws, or something similar, instead of plows. The long point, running into the ground, is vicious in construction. I am confident that the time will come, and it is not distant, when steam will plow our fields, and they will be prepared at one operation, including harrowing and sowing the seed. Farm machinery is to be considered more with regard to its expedition in work than as to whether it is cheap. In these wet days it is of the utmost importance that we have work done rapidly during good weather. Oxen and horses are too slow. Mechanics do farm work in the winter. In their shops, while snow covers the ground, they construct machinery which does the work of summer.

Mr. Wm. S. Carpenter.—Since mowers have been introduced, we have improved our farms, and greatly added to their fertility by removing stones.

### SUPER-HEATED STEAM DRYER.

Mr. H. G. Bulkley delivered an address on this subject, stating that when above two hundred and twelve degrees, steam becomes more of an absorbent, and so increases to be as the heat is increased. A room containing super-heated steam, becomes a Turkish bath, that is, has a steam atmosphere, and proportionally, so far as the air is concerned, becomes a vacuum. Fruit should be dried as soon as ripe, and before it changes into sugar, that the starch may be secured. Mr. B. showed specimens of apples dried from fruit nearly a year old, which looked very white and nice. By this process, apparatus for drying fruit rapidly and well can be made as low as one dollar and twenty-five cents, and from this to much higher figures. Lumber also is dried by this process. It is placed on cars, and in passing through the building is dried.

Mr. Allen said he had seen a four-inch scantling dried so thoroughly as to destroy the grain; still, by good management, this could be avoided, and the wood could be seasoned to any required extent.

### NEWELL'S REVOLVING HARROW.

A committee appointed at a previous meeting to superintend the trial of this harrow, invented by Amos Newell, New York city, reported as follows:

The harrow used was the first and only of its kind made, and this was its first practical trial. Like a mowing machine, it runs on wheels, and has a platform and seat for the driver. At the rear of the platform, and resting on the ground, is a cylinder about four inches in diameter, and covered with sharp teeth. The motion of the wheels causes the cylinder to revolve in an opposite direction to that of the wheels.

The trial was made upon a field which was broken up last fall, and a portion of it plowed again recently.

The soil was sandy loam, free from stones, but full of live roots of grass and weeds.

Although the harrow was newly made, a pair of horses hauled it with ease. There was no clogging, but all the roots and pieces of sods were thrown to the rear, and left lying lightly on the surface.

For pulverizing lumpy soil and tearing to pieces decayed sods, this harrow seems to possess advantages over other harrows. Yet, as there was no other harrow on the ground, the committee could not judge correctly of its comparative merits as a labor-saving implement.

### TO GET FRUITS WHERE THERE ARE NO NURSERIES.

Mr. C. Taber, an ex-nurseryman, with so much affection for the trade that he does not wish to injure it, but who still wants to see fruit more plenty, both in our markets and among the common people, sends the following:

"In going upon a new place, the first thing to be looked after is the fruit. If a good nursery is near, and one can spend $50 to $100, so much the better, but in the absence of either, or both, don't wait, but go to work at once. While one is waiting, another begins with the seed even, and in a few years has a bearing orchard. Apple seeds sown in the spring, or better, in the fall, will frequently make a growth the first season large enough to bud or graft the next, and in five years from that time a basket may be taken into the orchard. There is no mystery in raising trees. They will grow on any corn land, and they may be cultivated much the same way, only they should be in drills, say ten to twelve inches apart, in the row rather than in hills. The books give such plain directions about budding, one can soon learn, but it is important to have thrifty stocks. Or, by planting the seeds of choice varieties, some good sorts may be raised without grafting or budding. A few native stocks frequently can be found growing wild, and by transplanting and grafting in the branches, apples can be had in two or three years. Peaches will bear the third or fourth year from planting the pit, and by planting only fine sorts good varieties may be expected. Cherries are more difficult to graft, also to get fine varieties from pits; hence it is best to bud the seedlings the year after planting, and being of very rapid growth they soon come into bearing. Quinces, currants and grapes will grow from the wood of the former season's growth, cut up into suitable lengths in the fall, buried in the open ground or in the cellar, and planted in the spring. A stock of quinces may be got up in this way on which to bud the pear, or a few quince bushes may be kept as "stools," bending down the branches and covering with earth, to produce layers. A shoot of a thrifty grape vine may also be laid in a shallow trench, early in spring, taking last year's growth, and after the new shoots have grown a few inches, bank in earth around them, and by fall roots will be thrown out so that nearly every new shoot can be taken for a plant. Pears are more troublesome—except the dwarf on quince roots—but try what seeds can be collected; also, take up the sprouts under old trees, and above all, every wild tree of suitable size for grafting found in the hedges or along fences. Set the small sprouts in rows, and bud or graft the same as apples. Plums, where the curculio will let them grow, can be got up the same as cherries. If one has seeds of really good kinds, plant in the fall, and let them grow up as natural fruits; some good sorts will pretty certainly come from them. If a small but select stock of trees can be procured from a nursery to graft or bud from, so much the better. The raising of trees is not as mysterious as some people would have us believe."

## FEED AND TREATMENT OF COWS.

Mr. James L. Humphrey, New Bedford, Mass.—I raise corn for market and soiling purposes, and design trying several kinds this year to find the best, or that which is best adapted for both purposes, having large sweet ears and small stalks. I tried spring vetches for soiling last summer, and like them much. I sowed them on ground which I had prepared for barley, and obtained a large crop, which my cows relished highly. I fed it alternately with sweet corn. I have found one difficulty always in feeding largely on sweet corn; it has a tendency to induce garget; but as I fed it last year, I had no trouble in that direction. After clearing the ground from the vetches, which it left very mellow, I plowed and sowed to white winter wheat and grass seed, giving an application of ashes at the last harrowing, and now my wheat looks finely. I have never had trouble in raising good wheat on rich ground, early sown and fed off once during the fall. Have once raised thirty-two bushels of Southern white wheat to the acre.

One word more, in regard to a subject which has engaged your attention in your discussions, and which is of interest to dairymen generally. I mean caked bag in cows. I never have any trouble in that direction, no matter how fat the cow may be at the time of calving. I keep the best cows that I can get, and find it the most profitable for my purpose to have them calve only once in eighteen months. I feed moderately on grain—generally oats and corn mixed, with the addition of roots during the winter—so that my cows, though they may milk down thin during the first six or eight months, will always come up again in flesh before I dry them off. I never let them go dry less than two months; three is better if it occurs in summer, and I always take away the grain as soon as they are dry, and sometimes before if too much inclined to milk. For two or three weeks before calving, I keep them on a spare but laxative diet—if in winter, early-cut hay or corn fodder, and hay with a few roots, but no straw. After calving, give one pound of epsom salts, and a few hours after a warm bran mash—scalding the bran with boiling water—commencing to feed a little hay in twelve hours from calving, and gradually increasing to full feed after two or three days. Since I have adopted this course, I have had no trouble with the bag but what would readily yield to a few applications of hot water followed by dry rubbing.

### CANADA THISTLES.

Mr. A. Wachleigh, Hartley.—I have been a farmer more than forty years. The way I destroy thistles is to cut them down when in blossom, and it is quite as effective to cut them some four inches from the ground. A few will appear the second year, which are to be cut the same way, and that will be the end of them. Now, as regards plowing and hoeing to destroy them, I have a piece of land that has been hoed fifteen years, and there are ten thistles now where there was one when I commenced.

### TO CURE A KICKING COW.

Mr. C. Taber, Brooklyn, L. I.—Nothing is so good as a strong strap three feet long, with a buckle on one end, passed around both hind legs, just above the gambrel joint. It crosses between the legs so as not to slip down, and when drawn up tight brings the legs pretty close together. Strapping up the fore leg, compelling her to stand on the other three, will usually suffice, but a determined kicker will sometimes stand on two legs long enough to do mischief with one of the other legs.

### PAPER PAILS.

The American Papier Maché Manufacturing Company, Greenpoint, L. I., exhibited a few neat pails made of papier maché.

This is a new invention. The paper, by a peculiar process, is laid in sheets over a mold. It is largely used for sugar molds. A pail is said to outlast one made of galvanized iron, and to withstand an intense degree of heat. It is not affected by acids or other corrosive substances, and for use on ship-board is in request. The price is $1.50 each, at wholesale, which some members thought would prevent their coming into general use, while others said this should be no objection, because it would be counterbalanced by durability. The material has also been used for sugar molds with great success.

### MACHINE FOR GRINDING MOWING AND REAPING MACHINE KNIVES.

Mr. J. H. Coller, Poughkeepsie, N. Y.—This is a beveled, vulcanized, India rubber wheel, encased with emery, and so constructed as to grind two teeth at a time, without dulling either.

Mr. S. Edwards Todd.—I consider this an important invention—one that will go into general use.

Mr. Wm. S. Carpenter.—I fully indorse the qualities of this little machine.

### FARRS' HAMES' FASTENER.

Mr. H. G. Farr, of this city, exhibited his Utility hames' fastener which was highly approved.

### CLARK'S WINDOW SASH LOCK.

Clark & Co., Buffalo, N. Y., exhibited this unique window sash lock, which holds the sash at any desired point in the frame, without window weights or springs. It consists of a small metallic frame, having two small levers attached to it, with a roller in the end of each lever. One roller prevents the sash from descending, and the other prevents it from being shoved upward. The cheapness and efficiency of the device for the purpose intended, seemed to entitle this sash lock to great favor among the members of the Club. Adjourned.

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## June 4, 1867.

Mr. NATHAN C. ELY in the chair; JOHN W. CHAMBERS, Secretary.

### GAPES IN CHICKENS.

Mrs. Mary Riker, Cayuga, N. Y., asks what will cure gapes in chickens, as she had tried all sorts of remedies and had failed.

Mr. S. Edwards Todd.—The only remedy is to take a horse hair, double it, insert it in the chicken's throat, and bring out the worms.

Mr. Solon Robinson added that this subject had been before the Club a great many times, had been totally exhausted, and the conclusion was that the horse hair is the only cure.

The Chairman.—It is true that we have considered this question before, but wives now are raising chickens who at the time were chicks, and we must repeat these things. I have tried this remedy myself as the only sure one, but the first year I made the mistake of putting the horse hair down the wrong passage. It is in the windpipe where the worms are.

Mr. William Lawton.—A quill with the feathers clipped off and the large end inserted first will answer.

### MANURING CORN IN THE HILL.

Mr. James Bundy, Otego, Otsego county, N. Y., wrote to the Club thus, which was read by the Chairman:

"About manuring Indian corn in the hill, lately discussed at the Club, S. E. Todd says it is a good plan. Mr. Meeker says no. Mr. Todd is right. Mr. Meeker seems to be unconscious of the good effects of the fertilizing matter on the surrounding soil, not only up and down but horizontally. The fact is, manure prepares the soil to invite lateral roots as well as to feed them. The result is, more corn and better quality of grain. And, if pumpkin seeds be planted with the corn, there will be enough more to pay for the extra labor of applying the fertilizer in the hill. A hired man is not likely to do it well, unless the proprietor takes a row by his side and looks to him.

"The best manure is from the hog pen; the second best from the hennery; the third best from the horse stable. When manure is applied in the hill it should always be covered slightly with soil, so that no manure will be in contact with the seed, or directly under the growing plants."

Mr. S. Edwards Todd said farmers can carry fertilizing matter to the young plants much better than the roots can extend through poor soil when the manure is deposited. If soil be in a poor state of fertility, and the ground be marked off in check rows for example, with the manure spread broadcast, much of it is liable to be deposited two feet or more from the hills. Consequently, the young plants must work their way through all that distance in the poor soil before the spongioles can find much plant food. But if the manure be deposited near the hill, it gives the young plant a luxuriant start in the early part of the growing season.

Mr. Solon Robinson opposed applying manure in the hill, as he thought manure two feet away from the hill would promote the growth of the corn more than if it were nearer the hills.

Mr. N. C. Meeker.—It seems to me a very bad practice. As I said before, if in connection with broadcast manuring it will do well, because the corn will get an early start, and late in the season the growth will be kept up. But where manuring in the hill is depended upon, the lateral roots receive a check when they reach poor ground, and the manure does as much harm as good, particularly on poor land, though on rich land the case will be different, for it will be equal to manuring broadcast. For the same reason it is a very bad practice to manure fruit trees immediately around the roots; many trees receive great damage by coming in contact with manure. Nor does it do any good to manure growing trees at the trunk, but when spread over the ground so that the distant fibrous and feeding roots can reach it, the advantages are great.

Mr. Edward Hicks stated that he has made some experiments with applying manure in the hill and also broadcast, and thus far he had not been able to perceive any difference in the yield of grain to favor either practice. He said it cost the most to manure in the hill, and he obtained no more grain in consequence of that practice.

Mr. P. T. Quinn.—For many years we have experimented with great care on the application of manure in different ways, and the result of our experience is to spread our coarse manure broadcast, and to apply special manures, such as guano, bone dust, and the phosphates in the hill. In the latter part of the season, when the ripening and seed maturing process takes place, the broadcast manure most materially adds to the perfection of the crop.

Mr. Solon Robinson.—There is no doubt but this is the true method, and science will not get much ahead of it.

Mr. W. P. Peck stated that in certain sections of New York they cannot raise a crop of Indian corn without manuring in the hill, on account of the shortness of the growing season. Yet, by applying a little fertilizing matter in the hill, it promoted the rapid growth of the plants when they were young, and the roots are sure to take up a much larger proportion of the manure than they can reach when the manure is spread broadcast.

Mr. N. E. Parkill, Waybridge, Addison county, Vt.—It has been the universal custom in this vicinity to manure corn in the hill. My experiment was tried upon two acres of sandy loam, with a clay subsoil. It had been in potatoes the year previous, and was plowed the year before. On one-half I spread fifteen loads of manure, harrowed and planted the 20th of May. The other half manured in the hill and planted about the same time. Result: 1st acre, manure spread, forty baskets sound, sixty unsound corn; 2d acre, manure in hill, one hundred and ten baskets sound; twenty unsound corn.

Is land with a subsoil which is impervious to water more likely to retain the fertilizing qualities of manure than land which is said to leach, or will land leach to its detriment?

Mr. N. C. Meeker.—This question of manuring in the hill develops the fact that much depends upon the length of the season. To tell the truth, agricultural knowledge as taught, is applicable to long strips of country east and west, not to strips north and south. A class of facts suitable to forty-two degrees of latitude, cease to be facts when applied to forty degrees of latitude. The sooner we recognize this truth, the less confusion we shall have. This is an idea of such vast importance that it is not destined to be developed till agricultural literature will be based upon analysis.

Mr. Quinn.—I wish to call attention to the report of my remarks on plastic slate. It was in Mr. Harrison's place of business that another gentleman made the remark, which I repeated, about this roofing. I did not say that Mr. Harrison himself, but another gentleman, had the roof.

Mr. Solon Robinson.—I wish a committee would be appointed to investigate the whole subject, that people may know what to depend upon. Thereupon, a committee was voted for.

The Chairman.—I appoint P. T. Quinn as chairman, Solon Robinson, S. Edwards Todd, W. S. Carpenter, and Edward Hicks. All matters on plastic slate will be referred to this committee, and those who have anything in its favor, or who are opposed to it, can address the chairman of the committee.

### FIELD CORN STALK CUTTER.

A letter was read from Mr. Isaac W. Burgess, Pleasant Plain, Iowa.—Extensive corn growers long have needed a machine for cutting up the dry stalks on the ground, since, if plowed in their whole length, the young corn is apt to be torn up by the passing plow. This machine is like a roller, is drawn by two horses, and the stalks are cut into pieces a foot long.

### NEEDHAM'S PNEUMATIC RAILWAY FOR TRANSMITTING LETTERS AND PACKAGES.

A model of this contrivance was exhibited and explained by Dr. Vanderweyde. The model rested on a table about six feet long and two feet wide. At one end was a tight box, into which was inserted the axis of a crank containing a fan or blower. Out of this box issued a glass pipe with cut offs or brass sections, and which, going around the edge of the table, returned to the box. Small red balls were inserted through a slide into the cut offs, corresponding to stations, and the crank was turned. Immediately the fan produced a blast, and the balls were propelled swiftly forward, or were made to return when the motion of the crank was reversed. If the station gates were open the balls made the entire circuit. The motion is wholly obtained by the fan making the air more or less dense, and in ordinary action the pressure is about twenty pounds to the square foot. The London Pneumatic railway now is in successful operation. A full description of Mr. Needham's plan will be found on page 572 of the Transactions of the American Institute for 1864.

### HICK'S APPARATUS FOR HANGING HORSE HAY FORKS.

Mr. Edward Hicks, Hempstead, L. I.—This is to fasten the pully and chain of a hay fork to a rafter in the barn. A pole of the required length has a wrought-iron nail in the end; with this the pulley is raised, and a rod bent into two right angles, and working on a loose joint, easily is inserted under the shingles over the rafter.

Mr. Solon Robinson.—This needs no explanation; it is one of the best inventions I have seen for some time.

### IMPROVED PIPE JOINT.

Mr. A. B. Hurd, Watkins, N. Y., exhibited some tin pipe, which seemed to be put together in the usual manner of uniting leader and stove pipe. The pieces are made as usual to fit each other, as nearly as they can be; then a slot is cut in the end of each piece, about two inches long by one-fourth of an inch. By this means two pieces that cannot be united when made without the slot, can be readily put together and quickly taken apart by turning the two pieces in opposite directions. It was approved as an excellent contrivance, of which all can avail themselves by simply making a slot with a cold chisel in the end of the pipe.

### TRIAL OF FEED CUTTERS.

The trial of feed cutters, under the auspices of the American Institute, came off at the residence of Josiah H. Macy, Rye, Westchester connty, N. Y., April 18. The entries of machines were as follows: Three feed cutters, by George Hovey, New York city; eight cutters, by "Peekskill Plow Works;" one Hunt's Hoosier cutter, by J. D. Burdick, New Haven, Conn., to operate both by hand power and horse power; one Telegraph feed cutter from Griffing & Co., New York city; one Daniel's feed cutter, by John Vanderbilt, New York city.

The committee, consisting of N. C. Ely, W. S. Carpenter, Wm. H. Smith, Josiah H. Macy, W. P. Peck, and S. Edwards Todd, chose the following points of merit as a common standard for judging of the quality of the different machines: First, the capability of the cutter to chaff both hay and corn stalks; second, the capability of the machine to cut fodder long or short; third, the durability of the machine; fourth, the price of machine; fifth, the capability of the cutter to be operated by either horse or hand power.

Hovey's No. 5 hand power cutter, turned by one man and fed by two men, cut twelve pounds of hay in sixty-five seconds. The man who turned the machine exerted all his strength. This machine has eight knives, the edges of which cut against a hide roller, and the cut is about one and three-eighths of an inch long. On a second trial, this machine cut eighteen pounds of hay in one minute. This cutter cut, also in one minute, twelve and a half pounds of corn stalks, about one and a half inches long. One of the smallest machines of this kind cut nine pounds of stalks in one minute, when turned by one man and fed by two men.

The next machine tested was Gale's feed cutter, No. A, with one knife, cutting against a copper plate. In one minute, with one man to turn and another to feed, this machine cut eight pounds of corn stalks, about one and three-quarter inches in length.

The next was Gale's No. 1 hand cutter, turned by one man and fed by another. This cutter has three knives, cutting against copper, and it cut six and a half pounds of corn stalks in one minute, and seven and a half pounds of hay in one minute.

Hovey's No. 1 six-knife cutter was then tried, with one man to turn and one to feed, and it cut eleven pounds of hay in one minute. The knives of this cutter work against a rawhide roller.

Hovey's No. 3 cutter was tested next. One man fed and one turned, and cut thirteen pounds of hay in one minute. In this cutter there are eight knives cutting against a rawhide cylinder.

Gale's No. 5½ hand cutter was tested next, with one man to feed and one to turn, and in one minute the machine cut seventeen and a half pounds of hay. There are two knives in this machine, the edges of which cut against a copper plate. The length of cut was about one and a half inches. This is a machine of superior excellence and efficiency. At a second trial, this machine cut twenty pounds of hay in one minute.

Gale's No. 5 cutter was the next machine tested at cutting hay. This was an old three-knife machine, cutting on copper plate, having been in use for seven years, and it cut thirteen and a half pounds of hay in one minute, and eleven pounds of stalks in another minute.

The next machine tested was the Telegraph cutter, which cut six pounds of hay in one minute, one man turning and one feeding; and five and a half pounds of stalks in another minute, cutting the stalks about three-fourths of an inch long. There are three spiral knives on this cutter, and it will operate well with only one knife.

Daniel's cutter was then tested. With one man to turn and one to feed, this machine cut five and a half pounds of hay in one minute, and seven pounds of stalks. There are three knives on the cylinder, about one foot long, and the knives all cut with a square or crushing stroke.

Hovey's No. 7 cutter, having ten knives in the cylinder, was then tested. One man turned and two fed. The knives cut the hay three-fourths of an inch long. In one minute this machine cut ten and a half pounds of hay.

Gale's No. 8 horse power cutter was then tested. This machine has three knives, ten inches long, cutting against copper plates. It was driven by a horse power, and cut in one minute, two men feeding, forty-five pounds of hay, and about fifty pounds of stalks in another minute. The fodder was cut about one and a half inches long. This machine operated in a very satisfactory manner.

### HUNT'S HOOSIER FODDER CUTTER.

This machine was tested on the 1st day of June. The trial was eminently satisfactory to all who witnessed its operation. The chairman weighed twenty-five pounds of pressed hay, which is much more difficult to feed into a machine than hay that has been pitched from the mow. He also held the watch and noted the time.

One man turned the machine and two men fed it. In the first trial the machine cut twenty-five pounds of hay, one and a half inches long, in forty seconds. The second trial, twenty-five pounds, two inches long, forty-two seconds. The third trial, twenty-five pounds, one inch long, forty seconds. The work was very neatly done. The machine has one, or can be worked with two knives, and will cut fodder one inch, one and a half, two or three inches long, at pleasure. The knife is of a spiral form, and the bedpiece is adjusted to the knife. This cutter runs very easy, seems to be durable, and not at all liable to get out of order, and admirably adapted to the wants of heedless laborers, as well as those who have not sufficient skill to keep a more complicated cutter in order. Pieces of hard, barrel hoops and seasoned sticks of hard wood were fed into the machine when in rapid motion, without the least injury to any part of it. After the knives had cut these hard and knotty hoops, several pieces of paper were put through the machine, which the knife shaved into pieces as neatly as it could be done with a pair of sharp shears. Only a few bundles of Indian corn stalks could be obtained at this season of the year. Yet enough were procured to satisfy the committee that this cutter will reduce corn stalks to chaff with great rapidity, cutting them fully twice as fast as hay or straw can be cut with the same machine.

### CANNING GRAPES.

Inquiry was made by J. M. Clemmens, Granville, Ohio, how to can grapes so as to prevent tartar deposits.

The Chairman.—My folks canned fifty glass jars of grapes, and they kept well. Tin cans are not fit, and I do not want them about.

Mr. Squire.—The grapes should be cooked well, and then stand fifteen minutes.

Dr. J. V. C. Smith.—Why do we not imitate the Spaniards of Malaga, and pack our grapes? It is a simple process, and they always succeed, knowing nothing about science, and having never heard of a farmers' club.

The Chairman.—They are packed in the dust or chips of cork. Sawdust will absorb the flavor of the fruit.

Mr. Solon Robinson said that rice hulls, not chaff, are good. Mr. Baldwin of New Haven said that formerly the Malaga grapes were packed in jars, but now they use kegs, and the cork, being spongy, absorbs the moisture.

Mr. R. W. Holton.—These Malaga grapes are picked before they are fully ripe, laid on straw and turned over several times, during which the juice runs out of the stem. The bloom is always preserved.

Mr. Solon Robinson.—It is important to know that in packing fruit it should be perfectly dry, and the job should be done in the middle of a hot sunny day.

Mr. J. R. Sypher.—This Club has run after grapes for wine from time immemorial, and neglected to consider how grapes can be preserved so as to be good eating out of season. The wine drinkers have had their full share of our attention.

Prof. Vanderweyde gave an account of grape-growing on the Rhine, stating that after experimenting a thousand years, they had found that a particular grape is required for a particular soil, which is of limited extent, and of the effects of guano, which, when applied, so injured the quality of the wine that the guano had to be dug out and thrown away.

Mr. Williams spoke of the Catawba grape being preserved in a fruit room which was cooled by a fan blowing air through ice boxes. This plan was tried in Cleveland, and abandoned.

### EXHIBITION OF FLOWERS.

Mr. J. S. Burgess showed a fine collection of rare bouquet flowers, some of which came from China, which being distributed, he received the thanks of the members. Adjourned.

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## June 11, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### BOUDINOT STRAWBERRY.

Mr. H. Boudinot, Alexandria, Ohio, informs the Club that he has a new seedling strawberry growing on his grounds at Granville, Ohio, which promises to be a berry of great excellence, and asks that a committee be appointed to examine the plants.

The Secretary was directed to acknowledge the receipt of the communication, and invite Mr. H. Boudinot to show the strawberry at the exhibition of the Institute, and say that Mr. J. R. Sypher would visit his grounds.

### STORING SWEET POTATOES.

Mr. W. J. McGown, South Union, Kentucky.—I send you my method of storing sweet potatoes. In the first place, they should be carefully handled and sheltered, so as not to bruise them more than could be helped; sorting them well before they leave the patch, separating the cut, bruised and indifferent ones, to be placed in a bin to themselves, to be used first. A cellar is preferable, if you have one, that can be warmed up with a stove, and should be kept at a temperature of fifty to sixty degrees—never under forty nor over seventy degrees. Bins should be made open, and not to contain over 200 bushels; less in bulk would be better, and should set clear from the wall and floor, so that the heated air can pass around them fully. We used to allow them to go through a sweat before leaving the patch, but when they are fired immediately after cellaring, it is unnecessary, as the heat will drive out all dampness and preserve the potato sound and good until late in the spring. We put nothing with them, as they will keep best without anything.

If you are not provided with a cellar, they will keep well in the kitchen or shop, where fire is kept up during cold and damp weather. Boxes or barrels will answer a good purpose for storing them. They may be cellared as they are dug, but should be fired heavily at first to cure them. Potatoes stored in this way may be accessible at any season of the year, provided that none are disturbed only those that are moved from the bin.

We have kept potatoes, by the above method, for a number of years, with continued success. They will not rot if they are handled well, and the temperature is kept right. It is not too late to store them in this way, if parties wish to try the experiment. As for ourselves, we are perfectly satisfied.

Mr. H. C. Hall, Jackson C. H., Ohio.—In a former report of the Club, Mr. Stephen Blanchard, of Missouri, asks how to save sweet potatoes. I have never failed for six years. My plan is, to dig and handle carefully, lay on a dry floor and cover when the nights are cool, and when it is no longer safe to keep them out, procure perfectly dry chaff (wheat, oats or timothy), and put up in boxes, a layer of chaff and sorted potatoes alternately, until full. Care should be taken that the potatoes are not laid near enough the sides to freeze. Boxes of different sizes, the small set in the larger, and the spaces filled compactly with chaff, would make them still more secure. The boxes when filled should be set in a dry room (up stairs by the side of a chimney, in which fires are regularly kept, is best). We use them all winter.

### SKUNKS KILLING MEADOW MICE.

The same party tells the Club that the skunks had cleared out the rats on his place. I never knew before that they would catch rats, but I have long known them for most excellent mousers. Quite a number live and rear their young under my hay stacks, and I have tried very hard to protect them, but people will kill them in spite of remonstrance. They not only clear out the meadow mice from the meadows and pastures, but they are very fond of grubs, as you may see any morning, by going into the nearest cow lot, to their haunts—you will see a great number of very small deep holes, where they have been digging up the beetle grub. Will the Club put in a plea for these serviceable little animals?

### HINTS ABOUT HOP-HOUSES.

Mr. S. Edwards Todd.—The construction of a hop-house is very much a matter of taste, and there is no more propriety in prescribing inflexible dimensions and proportions than there would be in making such conditions for the construction of a barn or farm-house. Very wide latitude may be allowed for the means and wants of the owner, both as to proportions and materials. Where stone is accessible, and the circumstances of the farmer will permit, stone is the best material to use; because it is safer from fire, and retains the heat better during the drying season.

A hop-kiln twenty feet square answers extremely well for the purposes of a yard of from four to ten acres, although if used for the latter number, with a full crop, the picking would have to be regulated according to the capacity of the kiln, especially at the beginning, when, owing to the quantity of moisture in the green hops, the process of drying is much less rapid than in later stages of picking. A kiln of the size mentioned may have the rafters twenty feet long, starting from each of the four sides, and approaching within three feet of each other, in the center, thus leaving an opening three feet square for a ventilator. This opening may be covered by a revolving cowl, or by a fixed slatted ventilator. Upon the ground level there should be numerous openings, say six or eight in all, upon different sides of the kiln, and these should be fitted with slides, so as to be closed at pleasure. It is important that the area of these openings should, in the aggregate, at least equal—they had better exceed—the area of the opening left in the roof for ventilation. Should a violent wind prevail at any time during drying, so as to drive the fire about within the kiln, the slides upon the windward side may be closed. As soon as the hops upon the kiln are dried, all the slides should be closed, so as to stop the draft of air through them, for at that stage it can do no good.

A chimney may be constructed inside the kiln, or a stove-pipe may be carried up outside. A chimney economizes the heat, and, in the long run, if properly constructed, is the safer of the two. Up to a point at least a foot above the hops it should be eight inches thick, beyond that four inches will answer. Where the hops would lie against the chimney, it should be enclosed by a wooden partition, four inches from the chimney, so as to keep the hops from contact with the bricks.

It is now considered that a space of fourteen feet between the cloth and the ground floor is desirable. In old kilns it was very common to have the space only eight or nine feet, and these kilns worked well, but required much care. The advantages of a high kiln are that there is no danger of scorching the hops, that the heat is more equally diffused over the entire surface, and the fumes of the sulphur come more readily and certainly in contact with every portion of the hops upon the cloth. Some have raised the floor to sixteen and even eighteen feet, but experience does not commend that practice.

The posts may extend from four to six feet above the cloth, that being entirely a matter of taste and convenience. If too low, it is awkward to move about the kiln in spreading and removing the hops.

The ground floor may consist of well-rammed earth. The kiln floor should consist of slats. The seare generally one and a half inches square, and placed one and a half inches apart. Slats, one and a half by two inches, and two inches apart, laid with the one and a half inch face up, are preferred by many. The joints should be very smooth, and nailed so as to resist warping, or the cloth will suffer damage. These slats should run in the same direction as you wish to remove the hops after drying. This floor is covered by a cloth or carpet, manufactured for the purpose.

The sides, as high as the plates, should be thoroughly plastered to retain the heat, but the ceiling above the plates may be left unfinished; it is not desirable to have the plaster *over* the hops. Both the fire room and the drying room should be well-lighted by moderate-sized windows, so that the entire process may be carefully observed. Too much window, however, would cause a waste of heat. The door of the fire room, and the doors of the drying room, should each be furnished with a single square of glass, so that the condition of the interior may be noted without opening a door. Attached to one end of the building there should be a large and strong platform, to receive the hops in sacks, and a door should open into the drying room.

A kiln, such as is described, would constitute only a portion of a hop-house, for it has no room for storage. The floor of the store room may be on a level with, or several feet lower than the floor of the drying room, and should be large enough to contain the entire crop, for there is always some loss in weight and risk of heating in the bale, when hops are pressed in less than three or four weeks after drying. It is in the store room that the procees of curing is completed. If hops *must* be packed directly from the kiln, they must also be over-dried to fit them for such packing. This floor should be jointed, of seasoned stuff, and as smooth as possible. At a convenient place, with reference to the press on the lower floor, an opening, twelve or more inches square, should be left, in order to feed the press at the time of packing. The windows of the store room should be darkened while the hops are stored, as exposure to light is calculated to impair their brightness. The ground floor of the store room may be fitted and used for any purpose of storage, and will always be found useful on a farm. Double kilns are frequently used for large yards, but very often are less manageable than those constructed singly, as they are less controllable in the matter of draft. A double kiln is made by running a partition so as to make two fire rooms and two kilns under one roof, so that fresh hops may be laid upon one before those partially dried are removed from the other.

## THE CIRCULATION OF THE SAP IN PLANTS.

Mr. N. W. Bliss, Warsaw, Illinois, a member of the Institute, sends to the Club the following paper, on the circulation of sap in plants, read befóre the Warsaw Horticultural Society:

" It was, I think, the precocious son of a Roman scholar, who at the early age of ten years, was discovered, one day, by his father, engaged in inventing geometry. His father at once brought him a copy of Euclid, saying, 'Son! why waste your time, when your work is already done to your hand?' At the January meeting of this Society, after the expression on the part of several members, of some rather crude notions on the subject of the circulation of sap in plants, our ex-President remarked that he thought it one of those subjects about which little is known, and upon which the light of scientific investigation should be brought to bear. Now, nature acts by general laws, and our knowledge of nature is our knowledge of these laws, which are as universal and invariable as that law by which a stone when not supported falls to the ground. Agriculture is one of the oldest of human employments, and the organism, functions and component parts of plants, have of necessity been subjected to the interested observation of man from the first, and it would be strange indeed if the most prominent and noticeable vital action in plants had remained unobserved and the laws governing it uninvestigated and undiscovered. The circulation of sap in plants has not so remained unobserved or uninvestigated, and writers upon botany and vegetable physiology, from those authors of the earliest antiquity, of whose works only fragments are now extant, to those of the present day, say to us in the words of the Roman scholar, 'why waste your time, when the work is done to your hands?' The work of reinvention or rediscovery is slow and difficult as well as superfluous. I propose, therefore, to do little more than to collate a few of the established facts in regard to the circulation of the sap, and the offices which the sap performs in the growth of the plant. And first, what is sap? Webster defines it as the juice of plants, especially the ascending and descending juices essential to nutrition, but for our purposes, we need a fuller definition, one showing its composition; and it may, therefore, be defined as a thin watery fluid, composed of water holding in solution those materials necessary for the growth of a vegetable organism, to wit: salts, hydro-carbons and azotized substances. Water being the medium in which these elements, so indispensable to the growth of plants, are dissolved, and their introduction even, into the substance of the plant and passage through its tissues rendered possible, would seem to be a most important substance in vegetable economy, if not absolutely essential to the life of plants. Its composition is well known, two measures of hydrogen to one of oxygen, or in weight 88.9 parts oxygen to 11.1 parts hydrogen, and it is chiefly taken up by the roots, embedded as they are in the moist earth, although it is also absorbed by the leaves from the atmosphere, which always possesses more or less humidity. The salts, then, held in solution by water, are freely absorbed by the spongioles with which the terminal points only of the fibrous roots are supplied, and are subjected to chemical changes during their passages through the plant, but enter as elements of the sap and remain as tissues of the plant, being in no way exerted. As no means are supplied for a plant to get rid of deleterious substances if once absorbed, and as neither human reason nor animal instinct is given to plants to guide their rejection of such food as is unsuited to their growth, a wonderful selective power is given the plant, in the absorbent action of its roots, whereby it takes up such portions only of mineral solutions, both in kind and quantity, as the plant needs for its proper growth, however great the excess of its favorite and needed elements may be in the soil in which it stands. Different plants, growing in the same soil, will each select the mineral salt held in solution by the water in the soil, that it needs for its own proper growth; a familiar example is the selection of silex by wheat, and of calcareous substances by peas, when growing together, and the fact is easily shown by prior and subsequent analysis of the soil and an analysis of the ashes of the wheat and peas. The first step in the circulation of sap in plants is its absorption by the roots, and as the root is the basis of the plant and the principal organ by which it is supplied with nourishment, it is of first importance to consider its parts and mode of action. Its parts consist of the caudex or main body of the root—the fibrils or finer branches sent off from the caudex, which are the true roots, and the spongioles, which are the tender and delicate extremities of the fibrils or growing points, and this accounts for the facility with which these little rootlets penetrate crevices and force their way into the hardest earth. The fibrils consist of minute bundles of vasiform tissue, enclosed in a loose cellular epidermis, except at the extremities, where the tissue is naked and becomes exceedingly loose and spongy (whence the name spongioles, a diminutive of sponge), and has the property powerfully to absorb water. The root does not absorb moisture by its whole surface, but only by the spongioles at the extremities of the fibrils, where the pores are not obstructed by the epidermis. The members of the society will, therefore, readily see, not only the great importance of securing an abundance of these fibrils or true roots in all trees which they purchase, but also that the tender spongioles—the living flesh as it were—or sensitive points of the plant, exposed as they are, without covering of epidermis or skin, shall not be dried up or injured. The causes of the absorption of fluids by the roots, and what forces are engaged in driving the ascending sap through the proper vessels to the leaves, and finally to its proper uses in the economy of the growth of the plant, as well as the structure of the vessels themselves, have been subjects of much inquiry and dispute; some thinking that the spongioles are of the exact nature of a sponge, that they therefore expand at the approach of moisture, and when surcharged with it, contract and force it into the vessels of the fibrous roots, thus acting as both suction and force pumps, by alternate dilatation and contraction, and that the ascension of the sap to the leaves is caused by capillary attraction; others by an invisible valvular structure of the sap vessels, while still others attribute it to the action of that mysterious agent, electricity, which, on account of its occult nature, is made the scape-goat of modern miracle workers to bear the sins of their too ready belief, out into the wilderness of exploded humbugs—saying 'that the circulation of sap is carried on by positive and negative electrical conditions, the laws of minus and plus, or want and supply, which carries on the commerce of the world.'

"Probably the phenomenon in natural philosophy, discovered by Dutrochet, to wit, the creation of an endosmose or inflowing, and exosmose or outflowing current, by the juxtaposition of two fluids of different densities, separated by a porous septum, will explain the absorption by the roots; while the following proposition of Professor Draper will account for the passage of the sap through the sap vessel to the leaves, when taken in connection with the evaporization of a portion of the water by the leaves, to wit: 'If the force of attraction of the particles of a solid for those of a liquid exceeds half of the cohesive force of the latter for each other, but is not equal to the whole force, the liquid will pass through a pore of that solid substance, and in capillary tube of it, will rise above its hydrostatic level.' But time and space will not serve to pursue these curious and interesting investigations. I propose to do little more in this essay than to try to show where sap comes from, where it goes to, and what becomes of it when it gets there. The crude sap, then, after being absorbed by the spongioles, is conducted by the vasiform tissue of the fibrils to the vessels of the main roots, and is then elevated to the leaves through the ducts and fibres of the alburnum portion of sap wood of the stem of the plant. On its way from the roots to the leaves, it is somewhat modified by dissolving the previously formed secretions, which it meets with on its way. In the leaves, it is converted into proper juice or latex by the combined action of exhalation, absorption, respiration and digestion. By exhalation, the superabundant water of the sap is given off to the atmosphere, and the remaining sap thus reduced, as it were, by concentration. It is analogous to perspiration in animals. Although absorption is chiefly performed by the roots, the leaves also absorb in a less degree, and thus upon occasion may, for a limited time, supply the want of full action on the part of the roots. Respiration is analogous to breathing in animals, and though performed chiefly by the leaves, consisting of the absorption of oxygen from the atmosphere, and the evolution of carbonic acid, is also partially performed by other parts, even by the roots. It is carried on with peculiar activity during germination and flowering, and its effect appears to be: 1st, the ridding the plant of a portion of carbonic acid, as respiration in animals removes the same acid from the blood; and 2d, the conversion of starch into sugar, in germination for the nourishment of the young plant, and in flowering for the nutrition of the pollen and the ovules. Digestion consists in the decomposition of carbonic acid by the green tissues of the leaves, under the stimulus of light, the fixation of solid carbon, and the evolution of pure oxygen. The crude sap then comes to the leaves a thin watery fluid, and by the elaboration spoken of, is converted into true sap, and descends by the lactiferous tissue of the liber, a part carried inward by the medullary rays, is diffused through the whole stem, and the remainder descends to and is in like manner diffused through the roots, both for their nourishishment and to maintain the conditions needed to insure the endosmose current. At the end of spring, a portion of the sap, now transformed into a viscid, glutinous matter, called cambium, is deposited between the liber and the wood, becomes organized into cells, and forms a new layer upon each. After the fall of the leaves, and the consequent cessation of all elaboration of sap, the roots still continue to act, and an accumulation of sap takes place, and the plant becomes surcharged with sap, so that instead of the sap retiring to the roots, there to hybernate during the winter, like a bear in his den, leaving the upper portions of the plant in a measure free from sap, these portions generally have an unusual quantity, and upon cutting through the sapwood, this superabundance will cause a flow of sap, as in the sugar maple, but after the leaves begin to act again, the flow will cease. The sap ascends with extraordinary copiousness at two periods of the year, spring and autumn, especially spring, and most plants have some peculiar function adapted to each period of the year. The vegetable clock work is so set as to go for a solar year; and plants have, by their nature, a periodical character not dependent on meteorological causes, which shows a thorough adaptation and agreement of the floral to and with the astronomical calendar, showing a harmony of arrangement such as always, and in everything, works the work of the all-wise Creator."

### NEW LIGHTNING CONDUCTOR.

A new lightning conductor was exhibited, which was made of strips of copper, formed by dies, into the shape of two distinct tubes, laid side by side with each other, so that when cut, the traverse section resembled the figure 8. The rod was twisted, as is customary to make some kinds of rods.

### PRIEST'S IMPROVED BASKET.

Mr. W. H. Hunt exhibited one of these baskets for picking and handling fruit. It is designed for use in gathering fruit upon the tree, and when the basket is filled, it is let down to the ground by the operator by means of a cord; when the cord is slacked, the rod to which it is attached slips through the basket handle and allows the hinged bottom of the basket to open outwardly, and the fruit is gently discharged as the basket is raised.

### HAND CULTIVATOR.

Messrs. Blymer, Norton & Co., Cincinnati, Ohio, exhibited a hand cultivator. It consists of a light frame, supported upon two wheels at each end, with handles like a plow, and has a set of implements for dressing the soil, by harrows, scuffle-hoes, &c., and an iron wheel for cutting the runners off strawberry vines.

### AGRICULTURAL BOOKS FOR FARMERS.

Mr. S. Edwards Todd, from the committee to select a few of the best books for the practical use of farmers, submitted the following report:

"The committee on agricultural books, in response to the requests of correspondents, to designate a few of the best books for practical farmers, desire to state that they have selected the following books as being the most reliable that can be found in our agricultural libraries, viz: Facts for Farmers, by Solon Robinson; The Family, the Farm and the Garden, by E. G. Storke; The American Fruit Culturist, by J. J. Thomas; Tucker's Annual Register, by J.

J. Thomas; Randall's Practical Shepherd, by Henry S. Randall; Johnston's Elements of Agricultural Chemistry; French's Farm Drainage; Liebig's Natural Laws of Husbandry; Jennings' Works on Horses, Cattle and Swine; Allen's American Farm Book; Mead's American Grape Culture; The Horse in the Stable and the Field, by Stonehenge; The Illustrated Poultry Book, by W. B. Tegetmeier; How to Farm it Profitably, by Mr. Alderman Machi; Rand's Flowers for the Parlor and Garden; Parkman's Book of Roses; Rand's Garden Flowers; Rand's Bulbs; Burr's Garden Vegetables; Burr's Field and Garden Vegetables."

On motion, Todd's Young Farmers' Manual was added to the list, after which the report was adopted.

### COTSWOLD WOOL.

Mr. S. Edwards Todd exhibited a specimen of wool from a Cotswold yearling buck, that measured seventeen inches in length, the weight of the fleece was eighteen pounds. Adjourned.

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## June 18, 1867.

Mr. N. C. **Ely** in the chair; Mr. **John W. Chambers**, Secretary.

### EXTERMINATING THE CURCULIO.

Dr. Isaac P. Trimble exhibited a branch, bearing fruit, which was taken from an apricot tree, which, he said, will probably bear five or six bushels of choice fruit. The tree stands near the dwelling-house. He could not determine by what means the curculio was repelled from that fruit. Yet, from some cause or other, the little "Turk" has not disturbed it. Whether it is attributable to the presence of cedar trees or not, he could not state.

Mr. H. B. Smith said that he has ascertained one fact this year, that chickens do like curculios, and will eat them with avidity. He has made a coop around a plum tree, as large as the diameter of the top of the tree. He has practiced jarring the trees, and the chickens would devour the curculio. Yet this practice is not a perfect security against the ravages of this insect. His plums are stung with the curculio, and are now dropping off the trees.

Mr. N. C. Meeker called on Dr. Trimble to state an effectual remedy for the utter extermination of the curculio.

Dr. Isaac P. Trimble said, this insect attacks apples, pears, and almost all kinds of fruit. After the fruit has fallen to the ground, if you will let the pigs have the fruit, or if the fallen fruit be gathered by hand and destroyed, the curculio will be effectually destroyed forever. The more chickens and birds you have, the less curculios you will have to destroy your fruit of any kind. The only successful remedy is to jar the trees and catch the destructive "Turks." Fruit can be raised in spite of the curculio. In New Jersey, he said, some societies have resolved to pick up all the fallen fruit, for the purpose of exterminating this insect. In almost all of our orchards, the ground is half covered with fruit which has dropped prematurely, in consequence of having been stung by the curculio. If you will cut this fruit into thin slices, you will find a small grub. This is the curculio for next year. Let these grubs be destroyed, and you save the crop of fruit.

### STRAWBERRIES.

A large quantity of this fruit was on exhibition. Mr. Bryan, of Vineland, had a seedling of some promise, beside a very fine collection of many varieties. Mr. Cavanah, of Brooklyn, had nice large fruit, also Mr. Williams, of Mount Clair. The finest specimens were Trollop's Victoria. Mr. Chas. Harmer, of Philadelphia, Pa., not hearing that the fair was postponed for one week, brought his somewhat celebrated berry called Slinger's Seedling. It attracted much attention, and a committee was appointed to examine it and report. The fruit is very large, and said to be prolific. The committee reported that it is a good market fruit, large, is hard, and of poor flavor. Quite an animated discussion followed. Some condemned it as having no flavor at all, and Mr. Lawton said the season has been very unfavorable for bringing out the flavor of any berry. Among the twenty or thirty different kinds of strawberries, the Wilson seemed as good as the best, and superior to many. It has more sprightly acid, and decided character, than any strawberry known. There were specimens of the Agriculturalist which were very good; indeed, for beauty and size, exceeded the Wilson. It is now known that there are many localities where the Agriculturalist is a very poor bearer. Knox's 700 was shown, and Mr. Cavanah said it differs from the 700 first introduced. It was fair. Barnes' Seedling, strongly resembling the Wilson, was shown, and is promising.

### ROSES.

Mr. Wm. A. Burgess, Glen Cove, L. I., exhibited a great variety of beautiful roses, and every lady had a large bouquet. Mr. Williams, of Mount Clair, also had a great variety of roses, and other flowers. So many were the flowers and strawberries that the room looked as if a floral festival were in operation.

### PŒNIES.

Mr. W. R. Prince, Flushing, sent one hundred varieties of pœnies. which were placed in beautiful array on the table, with their stems in glass jars filled with water. Among those exhibited were the Chinese, Turkish and European varieties, all of which were very large, of variegated colors.

### RIPE PEACHES.

Mr. Daniel W. Coit, Norwich, Conn., showed a few uncommonly large peaches, grown in pots. He stated that he had grown them successfully for several years. Some of the trees were only four feet high, and bore fifteen to twenty peaches; and some were ten feet high, and bore as many as one hundred peaches. This is a branch which requires more general attention, particularly by amateur cultivators.

### ORGANIC STOMACH OF THE OX.

Dr. J. C. V. Smith then delivered an address on the organic stomach of the ox, with a view to impart instructions for the economical management and feeding of animals. Everywhere there are two opposing forces. One is the quiet and domestic, the other is the untamable and ferocious. The ox is one example, the lion the other. It is the same in human society. It is difficult to explain why this is so, but we know it is in the order of creation. The ox requires large quantities of food, it remains in his stomach a long time, but the relative amount of nutrition needed is small. A carniverous animal has only one stomach, and requires food more condensed and nutritious. Generally, animals which chew the cud have firm stomachs, to fill which requires great bulk of food, and they must be filled or they will collapse, and the opposite walls will meet and destroy each other by their voluntary action. Hence, when the food of such animals is concentrated, its health rapidly declines. The slops of distilleries do not sufficiently distend the stomach, and the milk secreted therefrom must be the cause of many diseases of children. First is the receiving organ called the paunch. The ox will feed all day, and at its close convert its food into nutriment at its leisure. It makes balls of its food by chewing it, then one after another lets it down into the paunch, till this organ may be compared to a basket filled with eggs. At night, on lying down, the process of using the food commences. These animals like company, for they are social. A cow will not give as much milk when solitary as when associated with her kind. Digestion now commences with a reversed action. One of the balls comes back into the mouth, when it is chewed over and made into a smaller ball, when it is discharged into a second stomach by another passage, the entrance to which is under the animal's control. The second stomach is composed of that substance of which tripe is made. There a fluid is secreted and mixed with the food so received, and becomes of a yellow color. Here the ox has no further control of the food. Thence the food drops into the third stomach, which is smaller, and here the food is mixed with a white fluid, where it drops into the fourth stomach in a yellow, creamy stream. In this stomach it becomes arranged in layers, and by the secretion of another and peculiar fluid it is changed into curd. In calves this stomach is used for rennet in making cheese. In the earlier ages of the world, when habits were simple and wants were few, the only cheese used was obtained from this stomach of the animal. But afterward it was found that the material of the stomach itself would curdle milk, and hence came the manufacture of cheese. Thus we see, the food of these animals must go through the various wonderful processes described, and finally be changed into curd, before it is fitted to furnish nutriment. Balls of hair sometimes are found in the first stomach, from one inch to four inches in diameter. In the spring cattle curry each other, to allay irritation, by licking, and in so doing they cannot get the hair off their tongues outward, but are forced to swallow it, when, naturally, it takes the shape of balls. The animal tries to expel it, but the structure of the tongue prevents, when it is swallowed again, and it is kept going to and fro and up and down many times. Of course, such a foreign substance often will produce disease, which is likely to have many names, and for which medicines totally inefficacious are prescribed. It is obvious that at the season named, nothing is more important in the treatment of cattle than to curry them with the curry comb to prevent the formation of these hair balls. It is no economy to feed slops to cows, for the reason that the organ under consideration is for the purpose of digesting grass, and not fluids.

The camel has a peculiar capacity for carrying fluids unlike any other animal, for the purpose of adapting itself to regions without water. In connection, I would relate that a dog was found on a ship where all the human beings had perished, and its life had been preserved for twenty-three days by its living on the cover of a bible, for the wood had kept the sides of the stomach apart, and the little nutriment in the leather had furnished nutrition. In London, I heard of a stable where four hundred cows were kept, and I had a great curiosity to see so many, not knowing but when I should return, I might think the circumstance worthy of being related. I found them extremely fat and sleek, and yet the owner told me they were doing badly, for every morning he found at least one dead cow, and he had to keep men in the country buying, so that every morning a fresh cow could be driven in to fill the place of the one which died. He said the reason for this mortality was the want of ventilation. He knew it very well, but people must have milk, and he could not help it. If a want of fresh air is so important for animals, certainly it is not less so for human beings, and the mortality in one must be as great for the same cause as in the other.

The Arab horses are the best in the world, and their capacity for endurance excels anything we know; and yet they are fed on coarse straw, thrashed out by the feet of oxen, and dry beans and barley; nor are they ever struck a blow. Beans would be good food for cows, for they contain large quantities of the properties of butter. The exquisite flavor of the peach is prussic acid, a deadly poison, very much diluted; so of many other kinds of food, but the chemical power of the stomach changes it in character. The solvent power of the gastric juice of the human stomach is the most powerful in nature. When children swallow buttons, or even nails, this fluid will pick these hard substances into pieces. Now, the stomach of the camel is provided with a series of pockets, which hang from its lower side. I remember that when we were about to start from Cairo, in Egypt, across the desert, and the camels were all loaded with several hundred pounds each, and I was seated ten feet up in the air, on the camel's rump, that the Sheik said that nothing remained but to water them, and we went without the gates, when these animals drank as if they had had no water for a long time; but they were far from being thirsty; they were only laying in a cargo of water for a long voyage across the desert sands. In drinking, one of these pockets of the stomach opens, and when it is filled it closes, and the water runs into the next pocket, and so on till all are filled. On the journey, the dry food being taken into the stomach, one of the pockets opens, and a little water rises to moisten the food. On that occasion I rode sixteen days, during which the camels had no water. Some time after this period, all the water in these pockets will be exhausted, when the sufferings of the animals will be extreme. Not unfrequently is it the case, when on long journeys in the Orient, the supply of water for the master and his people is exhausted, when there is no other resort than to kill a camel, however reluctant they may be to do it, however highly it is prized, and no sooner does it fall than its side is cut upon, and the parched lips are applied to one of the pockets, where water is found as limpid and as pure as from a mountain spring. These studies show the wonders of creation, and when we view other objects, from the humble insect to the magnificent hosts of the starry sky, we cannot help confessing that the hand which made them is divine. The learned traveler and eloquent speaker then promised that when he should return from Boston he would speak on the stomach of the horse, and show, among other things, that often he is cruelly treated by being made to take filthy and offensive medicine, when if nature were permitted to use her remedial powers, health would be restored.

On motion, the thanks of the Club were unanimously voted to Dr. Smith for his interesting paper, of which the above is an abbreviation.

### TURKISH CLOVER.

Mr. S. Edwards Todd brought a stool of Turkish clover in full bloom, with the roots in a box of earth, which was taken from the meadow of S. R. Colwell, Weymouth, South Jersey. There were more than fifty heads on that one stool, the blossoms of which were as red as fresh blood. The heads are three inches long, and after the blossoms have fallen, they appear like large and repulsive caterpillars. Mr. Colwell has several acres of this kind of clover growing on very light, sandy loam soil, side by side with a few acres of the common red clover, *Trifolium Pratense*. Both kinds of clover had been mowed when this stool was taken up, June 14, and the second crop was in full bloom, and would be fit to mow in a few days. The Turkish clover is ten to twelve days earlier than the common red clover, and yields, on that light soil of New Jersey, three crops in one season. Mr. Colwell feeds the green clover to his stock and teams, and is well pleased with it as a plant for making pasture or hay.

### POTATO CULTURE.

Mr. Jas. Warren, Monroe, Jasper county, Iowa.—It is a deplorable fact that potatoes for a number of years have been diseased. A disturbance seems brought about by mismanagement in its cultivation, which has been repeated and augmented continually, from its first introduction to the present time. Although this tuber is exceedingly tenacious of existence, and we still succeed in raising meager crops, some, or part of which, will still do for human food, yet the whole race is affected, and if we do not adopt measures so as to assist nature to regain her power, the potato will eventually be lost to mankind. Nature allows a considerable margin for casualties and indiscretions, but she will not forever be trifled with. I have been familiar with potato culture about forty-eight years, in various countries and climates of both hemispheres, and my earliest recollections are that most of the plants bore clusters of seed-balls, and some of them did not, which shows that the disturbance was progressing even then, but not far enough advanced to cause much damage. The late varieties produced less seed than the early kinds, simply because the preceding generations had been prematurely cut down by frost in the autumn, and from that time there has been a gradual decrease until of late years a cluster of seed-balls is a novelty. Now, the potato being hermaphrodite in character, it is the intention of nature that each blossom should fructify itself and others growing near; that each plant should bear and mature seed to perfect ripeness. Either the seed or the tubers is then in fit condition to propagate, and not otherwise; for there is a sympathetic action going on, in and between the seed, the tubers and all other parts of the plants during the process of elaboration and assimilation of the vital principle, the imponderables and the grosser materials, in their proper proportions and at the same time, which is to insure to both seed and tuber the ability to transmit a perfect organism to the next generation. If this natural process is frustrated in a small degree, the organism must be imperfect, and although a tribe of tubers may carry on the work of reproduction for a length of time under these adverse circumstances, their vitality must at length be expended. Fungus now takes hold, and hastens decay, when infusoria, &c., enter, and the tuber is dead, simply of exhaustion. It has been the general practice of farmers to make two plantings in each year, an early kind for summer use, and a later kind for winter use; the first planting is done as early as practicable in the spring; the sets used are taken from what happens to remain of the preceding year's crop, of the early kind, with little or no selection, while the first shoot above ground is often cut back by frost. Then as soon as the young tubers attain the size of hickory nuts, the fibrous roots are laid bare and the immature plant remorselessly robbed of its immature progeny for early use. This robbery often is repeated, to the great detriment of the plant. Being thus robbed, they generally are left in the ground to be dug up at the time of the late crop; and if they have made second or even third growths, or produced seed or not, the husbandman cares not; he thinks potatoes are potatoes; and from such he expects sound ones may be propagated. But nature says no. If you will not exercise reason and act in concert with me your potatoes shall die, and I will feed my infusoria with them. The late crop is generally planted so as to allow them barely time to make tubers that will barely keep through the winter, and the vines are often cut down by frost before the seed is matured; in which case the tubers have an imperfect organism. Some seasons they make a considerable second growth, and very few plants have sufficient vital energy necessary to fructification, and consequently they bear no seed. At the approach of winter they are dug, but no selection is made for next year's sets. Those which are not marketed are often culled over through the winter. The most comely are taken for table use, and the misshappen ones left for seed. Now, a tuber which makes a second or lateral growth imparts a portion of its substance and vitality to the out-growth. It is then not very good for food, and much less so for seed. Nature has decreed that potatoes may generate healthfully, once in one year and no more; all beyond this is unnatural; and that which is unnatural cannot endure. By a continuation of such practices, sooner or later, death by exhaustion must be the inevitable consequence. Hence it is necessary to adopt a new and more efficient practice, in order to reclaim and perpetuate the potato. Choose the best known variety, which has the quality of maturing in a moderately short time. Take it under your special care. Plant it either for summer or winter use, the difference being only in the time of planting. For summer, as early as you choose, at your own risk; but make no reservation of seed-tubers. In determining when to plant for the main crop, several things should be considered, such as late and early frosts, latitude, elevation, &c. Good husbandry will be necessary as a matter of course, but be careful not to disturb the roots, after blossoming. When the vines are ripening, go through the patch, and mark every hill or plant bearing seed, and when the seed is fully ripe, dig up those you marked, and from their product, select all the well developed tubers, having the general characteristic of your variety, and reject all others. Let these get quite dry, place them in a cellar or pit, where they will be secure from frost, moisture, and vermin; pack carefully, filling up the spaces with dry sand, and have a layer of the same on top. If in a pit, put no litter within, but only sand, and earth up well; thatch thoroughly to keep dry, and also to retard thawing at the breaking up of winter. This is your seed for next year. Guard it with jealous care. Nature confides it to your charge; as you care for it, she will care for you; as you try to assist her in carrying out her intentions, she will reward you; and by persevering in this way, in a few years the potato will regain its primitive health and vigor, every plant will bear seed, and the rot will be known no more.

### MELILOT CLOVER FOR BEES.

Mr. H. M. Baldridge, St. Charles, Illinois.—For several years I have been experimenting with honey-producing plants, in order to find one or more plants that will pay to cultivate expressly for honey purposes. The best plant I have found is Melilot clover (*Melilotus Leucantha*). As its name indicates, it is purely a honey plant. It blooms in this latitude from July to December, but further south is in blossom a much longer period. The plant grows rapidly, often attaining the height of from six to eight feet, and shades the ground completely. The tap root grows to considerable length, and is seldom out of reach of moisture. The plant is, therefore, not materially affected by drouth. Early frosts injure the blossoms but little, and even when wholly destroyed, the plant is again in full bloom in the course of three or four days. Bees can work on the blossoms in this latitude (thirty miles west of Chicago) one hundred days at least, which is time enough to give every good, strong hive of bees a surplus of fifty pounds. Ten acres of this clover, it is thought, will give full employment to an apiary of one hundred families.

### SHERWOOD'S WIRE GAUZE STRAINERS.

Manufactured at Lowell, Mass. A variety of these article, including some fruit-dishes, and articles for common domestic use, such as for coffee-pots, also for sifters, egg-boilers, &c., were exhibited, and much admired.

### A CORN HUSKER,

O. M. Pond, Iowa, being a flat ring, part of brass and part of rubber, to go over the hand, and having a flat horn coming out of the brass, seemed an ingenious device for the object stated.

### SUMMER COOK-BROILER AND FLAT-HEATER.

Judging from the numerous inventions for economizing fuel, inventors are studying economy in all its most rigid aspects. Mr. Bond showed a device for saving coal in the summer, when but little fire is required, which consists of an iron vessel, somewhat like a low dish-kettle, having holes and slots in the bottom, through which air may enter when a fire is kindled in the furnace. A small quantity of coal, it is said, will boil a teakettle, or cook meat, or heat flats, with much less coal than is required to do the same amount of cooking in a stove.

### THE LITTLE GIANT STUMP MACHINE.

One of the most useful machines on farms when rocks are to be lifted or stumps are to be pulled, is a light, cheap and powerful machine with which two men can perform the labor of several hands with a machine of the old style of stump-pullers. For the purpose of showing how the farmers in South Jersey take out their stumps at a cheap rate, Mr. Parven, of Forest Grove, brought in a small model of the "Little Giant," which is cheaply made and very powerful. Two men can carry it with ease, and place it over a stump and extract it quicker than they can cut down a tree ten to twelve inches in diameter. When on a visit where the men were clearing new land, at Manchester, N. J., numerous stumps were seen having tap roots six or seven feet long, which had been taken out by two men with a "Little Giant" machine.

### SCRATCHES IN HORSES.

Mr. R. Johnson, East Groveland, N. Y., informs the Club that kerosene oil is an effectual remedy for scratches in horses, and he recommends that kerosene be tried as a remedy for the foot-rot in sheep.

Mr. S. Robinson recommended washing the legs of the horse with strong soap suds, and then applying strong beef brine.

Mr. S. Edwards Todd said that it is essential to keep the stables well cleaned to prevent scratches. A preventive is far better than a cure.

### THAYER'S IRON MOWER.

Mr. O. Griffin, Fort Ann, N. Y., exhibited one of Thayer's iron mowers, which is claimed by the inventor as the simplest, cheapest and most perfect mower made—price, $100. Adjourned.

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## June 25, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary

### SCUPPERNONG GRAPE IN NORTH CAROLINA.

Mr. S. B. Woodmansie, Kenansville, N. C., writes: "The attention of the people of Eastern North Carolina, since the close of the war, has been directed to the cultivation of the Scuppernong grape, and the manufacture of wine. This is a native grape. It can be found, I may say, everywhere in this part of the State, in the woods and at the house of every citizen. Its indigenousness to the soil, the luxuriant growth of the vine, the certainty of the crop, all add to the increasing reputation of the Scuppernong. From the experience of those among us who have gone into the grape business extensively, it is believed that no part of the habitable globe is so well adapted to the cultivation of the grape as Eastern Carolina.

"Let persons interested in the manufacture of wine, and skilled in the grape culture, come and examine for themselves. We want capital and labor to develop our State, and can offer superior advantages to immigrants. Land can be bought at almost any price, from one to twenty dollars per acre; and on one acre from sixteen to twenty-one grape vines can be set out, which in a few years, with ordinary care and attention, will enable you to realize $1,000 per acre clear.

"Our people generally did not engage in the grape business before the war, because their attention was absorbed in other matters, and they looked upon the Scuppernong as a thing of luxury and not of profit. The expense and labor required to prepare and cultivate a vineyard in this country are insignificant, and in time to come this will certainly be a wine-producing section."

Mr. Cal. Harris, editor of *The Ohio Farmer.*—In the summer of 1860, I was on a tour in the South, and was treated to the wine of the Scuppernong, which I decided was the finest American wine I ever tasted, and I have no doubt but that vintners would make a good thing by investing in the culture of this grape in North Carolina.

Dr. Sylvester.—This grape grows very large in the South, though it will not live here. I have an account of one vine as large as a man's body, and it covered an acre of ground.

Mr. R. J. Dodge.—Let us understand that a great many years, say a good part of one's lifetime, certainly not less than ten years, are required to get this large size. Meanwhile, it is much better to have new vines, and have less fruit on each.

Mr. N. C. Meeker.—Fruit-growing on a large scale is usually a failure. But, before northern folks go down there, they had better wait and see how the pioneers get along. It may surprise some to learn that an acre of Catawbas on the Ohio lake shore, on the Crooked lake, in New York, and on the islands, will yield more fruit than the Scuppernong. The Concord even will do it. Seven tons to the acre is not an uncommon yield

### FILTERING WATER.

Mr. W. P. Darst, Perry county, Ohio, desires to know how he can filter his rain water before it enters into the reservoir.

Dr. Sheppard suggested that the leader of the eave-trough be so arranged that a few barrels of the water that falls first be turned off; and as soon as the roof is washed clean, let the clean water be collected in the reservoir.

Mr. George Bartlett drew a diagram on the black-board to show how the leader may be arranged to operate automatically, by having a hogshead placed where it will change its position after a few barrels of water have run off the roof, and thus allow clean water to flow into the cistern or well.

Dr. Snodgrass suggested that when people draw water to drink, they should open the stop-cock just enough to spread the stream of water as much as possible as it falls into the pitcher. He said this will mingle with it a large proportion of oxygen, and thus greatly improve its quality as a refreshing beverage.

### THE HORSE PROTECTOR.

Mr. C. Elveena, of California, exhibited this invention, which is a cloth or pad, on which a cup for holding water is placed between the ears, and is so constructed that a little water passes out at a time, and keeps the head moist. Certificates were read from Gens.

Meigs and Grant, and from Henry Bergh, President of the Society for the Prevention of Cruelty to Animals.

The Chairman.—Anything which alleviates the sufferings of this noble animal shall have my approbation. The progress of civilization, the comforts of life, and even the elevation of our own race, are in proportion as we have sympathy for domestic animals.

### EGG BEATER.

Mr. Hale, Newburyport, Mass.—This is a tube with a piston and a perforated follower, which is claimed to aerate the egg in a manner superior to any other process. The members thought favorably of it, but would have been able better to express their opinion if a few custard pies had been presented for trial.

### IMPROVED AXLE.

Mr. Howard Livingston, Auburn, N. Y.—The spindle fits into an air-tight box, which is easily taken out of the hub, and the nut is placed in the shoulder of the hub, while the point of the spindle revolves unfixed by any nut. The members were interested in the improvement, and expressed a wish to take a ride in a carriage, the wheels of which embody this invention.

### PATENT WAGON WHEEL.

Mr. D. B. Goewey, Binghamton, N. Y.—Sections of a wheel were shown, presenting the spokes in the hub with several dovetail joints. First, common mortises are made, the hub is softened by steam, when the spokes containing notches are driven. When the hub dries and hardens, the wood fills the notches in the spokes, making dovetail joints.

The Club thought this an invention beautiful at least, and likely to be of importance.

### STRAWBERRIES.

Mr. P. T. Quinn said that, in Jersey, last year, all kinds of strawberries failed except the Wilson. The Agriculturalist did so badly that he and hundreds of others decided to give it up. This year it has done well, in fact, almost all kinds have done well. He was encouraged and was going to plant more extensively.

Mr. Thomas Cavanah.—When we were at Hammonton, N. J., the subject was discussed whether plants will bear more than one good crop. We were shown some which had been in bearing six years and they are as fruitful as ever. The reason seems to be that the roots go down deep and do not heave out as on clay and loamy soils. Here they must be renewed, and here also, best results arise from growing in rows a foot broad, cutting off runners elsewhere. On such soil I do not know any variety that will grow best in hills.

Mr. P. T. Quinn.—According to my experience the plants die out in the center from year to year, and they produce sprouts on the outside, which, in a manner, makes it an annual plant. Therefore, I adopt what is called the half running system. I plant in rows two and a half feet apart, and fifteen inches in the row. I give thorough cultivation, and go through once in ten days. We cover in the winter with salt hay, and in the spring rake off between the beds. Formerly there was an idea that poor land was as good as any, but this has been abandoned. The ground must be well manured, have a fine tilth, and if possible all weeds must be kept out. If grass or white clover get in, the crop will be reduced one-half.

Mr. A. S. Fuller, Ridgewood, N. J.—I have rows this distance apart, and I plant a foot apart in the row, then I let them run so as to make a bed a foot wide; mulch two inches deep in the fall, and in the spring put the mulching in the rows, or take off on one side. As to varieties I would say, if one wants to be sure of having strawberries, let him plant the Wilson; with other kinds he is not certain.

The Rev. Mr. Foster and Mr. Durand, originators of new seedlings, spoke of their efforts.

Dr. Hexamer.—Manure affects the flavor. The larger fruit grows, the less flavor will it have. I do not manure highly. I prefer to give thorough cultivation, then I have good results. It pays ten times more to work than not to work.

Mr. A. S. Fuller.—I would ask the Doctor what he calls flavor?

Dr. Hexamer.—I call it the aroma.

Mr. A. S. Fuller.—I think we should take the wild strawberry for a standard. Still, if we do this, some kinds will be thrown out as not being strawberries. It is a question whether in raising large fruit, and getting berries with little character, we do little more than to reduce the flavor.

Mr. N. C. Meeker.—There are two things to be considered about varieties. One is, that no decision can be reached regarding new kinds for general cultivation, till they are sent out over the whole land, so that we can have an average result. Another thing, so great has become the competition that only first class fruit is likely to pay. Perhaps hundreds of bushels have been thrown into the docks in this city, within a few days, and shippers lost picking and freight. It is true that wet weather was one cause. But, at the same time, Mr. Knox, of Pittsburg, had strawberries ("700") selling in Broadway for fifty cents a quart. They are large, and the finest in the market. Now, other cultivators were raising this variety within a few miles of the city, but they got no such prices, for they have no such fruit. Mr. Knox's method is no secret, for he imparted it several years ago. His plan is to fill in between the rows with rye straw, quite deep; it keeps the fruit perfectly clean, and gives it a bright lively color. In wet weather the straw absorbs moisture; in dry, it imparts it. If this method will produce the same results everywhere, no other course is left than for us to adopt it, for by persisting in the present course, we are cutting each other's throats. I am decidedly of the opinion that the present system must explode. We are too ambitious and too industrious to succeed, unless we take the last steps and attain as much perfection as is possible.

### STRAWBERRIES IN SOUTH ILLINOIS.

Mr. J. R. Tewksbury, South Pass, Union county.—Through the kindness of the station agent here, E. T. Phillipps, I send the Farmers' Club the following account of strawberries shipped from this station from May 15 to June 16, 1867—a very backward season:

| | Weight, pounds. | Quarts. | Am't at an average of 20 cts. per qt. |
|---|---|---|---|
| Sent to Chicago | 334,120 | 225,750 | $45,150 |
| Sent to other points north | 30,625 | 20,675 | 4,135 |
| Sent to St. Louis | 13,635 | 9,225 | 1,845 |
| Sent to Cincinnati | 3,560 | 2,400 | 480 |
| Sent to Cairo | 4,260 | 2,875 | 575 |
| Totals | 386,200 | 260,925 | $52,185 |

| | | |
|---|---|---|
| Picking, 15 per cent | $7,827 75 | |
| Boxing, 10 per cent | 5,218 50 | |
| Freight, 11 per cent | 5,740 35 | |
| Commission, 10 per cent | 5,218 50 | |
| Fruit grower, 54 per cent | 28,179 90 | |
| | | $52,185 |

The above average at twenty cents per quart is, of course, only an estimate—good fruit would average as high as twenty-three or twenty-five cents per quart—but the weight and the quarts are exact. We had a fruit express train, expressly for fruit, from the 29th of May to this time (June 17—discontinued for the present), running through to Chicago, 323 miles, in nineteen hours. Freight, $1.50 per one hundred pounds. Many of us think the train was run on the wrong time, viz: leaving our station at ten o'clock A. M., shippers had to be in at nine o'clock, giving no time to pick in the morning; consequently the berries must be picked the day before, and be kept on hand from sixteen to twenty-four hours waiting for shipment. This will certainly be remedied, as the railroad superintendent is very willing to accommodate us.

### TWO STRAWBERRY PATCHES IN THE SOUTH.

Mr. C. Taber, Brooklyn, L. I.—Mr. E. Anderson, of Frederica, Md., set two and a half acres of strawberries last fall, in addition to about three acres already growing. They were all of the Wilson variety. The picking began May 25, sending two crates of thirty-eight quarts each, which reached New York on the 27th, and brought seventy-five cents per quart. He continued to send up to June 18, the last coming in very poor order, and had to be sold at eight to nine cents per quart. Footing up the sales, the gross amount was $4,142.92, or $3,728.62, after deducting ten per cent for handling.

The other patch belonged to Mr. W. I. Bishop, of Portsmouth, Va., who sent the first crate of sixty quarts to this market, May 15. They brought one dollar per quart box. His final pickings were June 6, and these being in poor order when they reached here, sold at eight to ten cents per quart. His crop of three and a half acres amounted to 9,480 quarts, and the gross sales were $5,152.10. These too were Wilson's seedling.

### RECEIPTS FOR BREAD.

Mrs. Lydia A. Jenkins.—After having spent several years in lecturing, preaching and doctoring, I and my husband have settled in this beautiful village. I will give you receipts for making healthful bread:

No. 1. Stir coarse Graham flour (or wheat meal) slowly into cold water to the consistency of wheat flour griddle cakes; continue stirring for a few minutes, that the batter may incorporate as much air as possible. Bake it in patty pans or any form of small iron or tin molds. Our method is to have tin forms, made from two to three inches square, and wired together by the dozen at the tinner's. Corn meal and rye meal are good made in the same way.

No. 2. Wheat meal biscuits. Pour boiling water upon wheat meal, and mold quickly into a rather soft dough, cut with a biscuit cutter after rolling to an inch in thickness. Prick the cakes and bake in a very quick oven.

No. 3. Wheat meal rolls. Mix wheat meal with cold water into a rather stiff dough. Mold for five minutes; roll out to an inch or less in thickness, and cut into rolls of four or five inches in length, and one in width.

All these are to be baked in a hot oven, as quickly as possible, without burning. They require the greatest heat at first, and a hotter oven than other kinds of bread.

Nothing should be put in but coarsely ground meal and water, if they are expected to be light. And they will be very light if made and baked rightly. It requires patience and experience to succeed well, unless one is a painstaking cook.

No. 4. Best brown bread. Three parts corn meal, two parts rye meal; or one-third each of corn, rye and wheat meal. Scald the corn meal thoroughly. Cool, and add the rye or rye and wheat. Stir as stiff as possible with a strong spoon, and bake in a stone crock or iron kettle, covered, five or six hours, very slowly at first. Or steam four or five hours and bake one.

There need be no dyspepsia and no unhealthy children where any of these forms of bread are made a staple article of diet.

Adjourned.

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## July 2, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary

### APPLE TREE BORER.

Mr. G. Morgan, Port Byron, N. Y.—I destroy the apple tree borer by applying pitch pine tar with a small paint brush, filling the holes made by the borer as full as possible. I have seen no signs of the pests since.

Dr. Trimble.—This cannot be so. The borer enters near the roots of the tree, and going up he fills the cavity he makes with chips. The holes which were filled with tar were where he left the tree. The damage already had been done. The apple tree borer generally comes from the nursery, and a single one will stock a whole orchard. Of course, oil will kill borers, whatever the kind may be, and there are many; but it must be applied directly to their bodies.

Mr. S. Edwards Todd.—I saved a large number of locust trees by shaving off the outside bark with a drawing knife in the spring of the year, and then applied pitch and linseed oil.

Mr. N. C. Meeker.—The best and only remedy, besides digging them out, is to keep the trees in a thrifty condition, and, at least twice a year, wash the trunks with strong soap suds, and allow no loose bark where the eggs can be laid. The great point is to keep the tree thrifty. If it is otherwise, something is the matter, and immediate attention is needed.

### THE FULLER RASPBERRY PRIZE.

As Mr. Fuller had offered one hundred dollars for the best market raspberry, and as the season for this fruit is at hand, the subject of a committee was taken up. After some consultation, Mr. Fuller modified his offer as follows: Fifty dollars will be given for the market berry which will bring most money, and fifty dollars for the best berry for family use. The Chair then appointed the following committee: Charles Downing, Chairman, Newburgh, N. Y.; P. T. Quinn, Newark, N. J.; E. Williams, Montclair, N. J.; Horace Greeley and Thomas Cavenach.

Mr. Wm. P. Peck gave an invitation to the Club to visit his raspberry grounds at Croton Landing, N. Y. Accepted.

### NEW VEHICLE FOR HAULING DIRT.

Mr. Jesse S. Lake, Smith's Landing, N. J., exhibited a new vehicle for hauling dirt. It lays a track as it is hauled by a team, is now in use for grading a railroad track, and a span of horses is able to haul five tons over sandy ground, when on a common wagon they could scarcely haul half a ton. A smooth, level surface is required. The members thought it an important improvement, and that it would be useful in the spring in hauling out manure over meadows.

### ROGERS IRON CULTIVATOR.

Messrs. Rogers & Ford, Rundels, Crawford county, Pa., presented a machine to the Institute. It is so arranged that the blades may be turned outward or inward, and raised or lowered, and is said to work in any soil. It is adjustable so as to do a variety of work.

### CULTIVATION OF COFFEE.

The Hon. C. N. Riotte, late resident Minister to Costa Rica, presented a quantity of the seed of the coffee tree for distribution.

### BOUDINOT STRAWBERRIES.

Mr. J. R. Sypher, having visited Granville, Licking county, Ohio, made an interesting report on this fruit, which shows that it has points of superiority to most kinds, and that it is worthy of attention.

### HUTCHINS' IMPROVED FUMIGATOR.

Ir. Isaac Hutchins, jr., Wellington, Maine, sends to the Club his improved fumigator. It is an iron cylinder with a round bellows at the base; in this cylinder is placed cut tobacco, light it on the top with a hot coal, then connect with the bellows. It will be found very useful to destroy ticks on sheep, and insects on plants. It is cheap and will be found effective.

The Secretary.—I have tried this instrument for fumigating rose bushes with great success.

### COMPOUND LEVER NIPPERS.

Messrs. Hall & Gifford, of this city, exhibited one of their compound lever nippers. It is a tool of great power, and considered to be a valuable invention.

### HOW TO KILL WIRE WORMS.

Mr. D. Marvin, West Alburgh, Vt.—Some time since you made inquiry as to the best treatment for wire worm. All our low lands in the vicinity of Lake Champlain are infested with this pest. Two years ago I broke a low, run out meadow of eight acres, in the spring, and sowed to oats, expecting the sward would keep them busy the first season; but they destroyed about one-half the crop. I noticed that where I harrowed in the seed they did not destroy it; but not burying it to suit me, I loaded the cultivator, put on three horses, and buried it deep. These were badly eaten. After the crop was taken off, we plowed the ground late in the fall, ridging it up and draining it. Last spring, waiting until I thought the seed would grow rapidly, I sowed to oats, having in a considerable sprinkle of buckwheat, purposely, twenty-six bushels in all, to the eight acres. This seed never came up. I never before saw a crop literally eaten up. The worms were so thick when we got in the seed that we could see the yellow fellows roll up behind the cultivator and harrow. The buckwheat, I ought to say, came up, but they evidently ate considerable of this, so that it was a lost crop. The last of June we put in the teams and plowed it all over, and sowed to buckwheat, one bushel to the acre, which, as the ground was strong, was too much by one-half; however, the crop was good but would have been better with less seed. We plowed again late last fall; the ground was clean and thoroughly fallowed, and on repeated examinations we saw no worms. Buckwheat is our only remedy. Experienced men prescribe two or three crops in succession, two at least, which do not deplete the strength of soil, and so thoroughly fallow it as to starve them out; and it is the only crop that will.

Adjourned.

## July 9, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### TUBE WELLS.

Mr. C. H. Latham, Randolph, N. Y., sends a description of his method of making tubular wells, which is done by driving an iron tube, preceded by a round bar, on which a sledge strikes, to the water. When driven a certain depth, the bar is removed, another length of tube is screwed on, the bar put in place, and the work goes on. On reaching rock, a drill is put to work.

Mr. N. C. Meeker.—At one place I saw the process, but the work was abandoned, because rock was reached. Perhaps they have a new method. Persons having inventions and wanting them introduced, should bring the models before the Club, that they may see that justice is done them.

### PHILADELPHIA RASPBERRY.

Mr. Wm. Parry, Cinnaminsen, N. J., presented a crate of this fruit in fine order, which was distributed. He says: "I have grown this variety for the last seven years; my great object is to make this variety known. It is perfectly hardy, neither extreme heat or cold affects it, and it is enormously productive. I picked sixteen hundred quarts yesterday of this kind of raspberry. Last week they sold in the Philadelphia market for fifty cents per quart. I have raised two hundred and twenty bushels to the acre, while of Doolittle's black cap, I have got only one hundred bushels. It is to other raspberries as the Concord is to grapes."

Mr. P. T. Quinn.—This is a valuable variety, and is undoubtedly worthy of cultivation for market. Still, its character is not high—it is wanting in flavor.

Dr. Isaac P. Trimble.—While I agree to all that is claimed for this variety, still, I think that Doolittle's black cap has no superior for intensity of flavor.

### ELM CITY RASPBERRY.

Mr. W. Parmelee, of New Haven, Conn., brought a few baskets of the fruit of the "Elm City" raspberry, a new and choice seedling, and claims that it is one week earlier than either the Franconia or Clark. The berries were tested by the audience, and pronounced of a choice quality of fruit, well worthy of cultivation.

The Chairman stated that he considered this a valuable berry, highly flavored, hardy, and very early.

Dr. Trimble thought there were others superior to this.

The Chairman.—It is a very early variety. On my place, at Norwalk, I have twelve varieties, but none are ripe, while these from New Haven have been ripe for ten days.

Mr. Wm. S. Carpenter.—This has the good quality of being enormously productive, but its character is not high enough.

### ROMEYNE'S SEEDLING.

Rev. Mr. Foster showed a few fine strawberries of the "Romeyne Seedling." He said that any plant is not a perfect plant that has not a perfect foliage. The reason why the Concord grape is the grape for the million is, it has a perfect foliage. This strawberry, he said, holds its foliage till the very last of the season. The Wilson and the Russell berries do not retain a perfect foliage to the end of the season. For this reason they are not as good as the "Romeyne Seedling."

This berry was stated to be more productive, and to produce fruit a longer period of time, than any other strawberry in general cultivation, as it comes in after the other varieties have disappeared. For this reason it is a valuable acquisition to our small fruits.

### SEEDLING CHERRY.

Mr. Wm. M. Doty, Star Landing, N. J., exhibited some seedling cherries, grown on his place.

Mr. Wm. Parry said the cherry was unknown to him; it was rather small, but had a pleasant flavor.

### APPLES—PIMM'S BEAUTY OF THE WEST.

Mr. J. A. Hurd, Crawford county, Pa., forwarded a lot of very fine apples of "Pimm's Beauty," which resembled the Rhode Island Greening, all in an excellent state of preservation. He stated that he buried one barrel of this kind of fruit, and only three apples were decayed in the spring.

Mr. Parry stated that this apple is highly esteemed in Pennsylvania as an excellent variety of winter fruit. The specimens were distributed and eaten, and pronounced worthy of cultivation.

Mr. Wm. S. Carpenter.—I have this apple but do not value it; it is only third class; still, in some parts of Pennsylvania it is highly esteemed.

### NEW CYLINDER CHURN.

Mr. Brown exhibited a small cylinder churn. This churn permits a circuit of air to pass through the cream. Instead of sending a circular, the inventor went to work right, for he not only brought a full-sized model, but a jar of cream also, and churned it. The Chair gave the word to turn the crank, and when the inventor said the butter had come, the time was declared to be only fifty-five seconds. This was so surprising, that several members said there was butter in the cream when it was poured in. Several ladies examined the pot where some remained and decided that it was cream.

Mr. W. C. Weld.—My wife is an experienced butter maker, and having a churn of this kind, I wish to say that after having had it in use from three to six months, we find no difficulty in getting butter in a very few minutes, and this during the hot weather of this month. There should be attention as to temperature, and age of the cream. All other quick-working churns that I have tried are unreliable in hot weather, as they bring butter pale, soft and lardy, while this is excellent.

### THE AMERICAN BUFFALO.

Mr. D. E. Baring, Solano county, California, refers to the rapid destruction of this noble animal, in which case there will be no more buffalo robes. It will be a disgrace to the American people to permit its annihilation. He could be easily domesticated and made to become a useful animal. On the frontier, are many men who could furnish calves, half tamed, to any one offering proper rewards, and this should be done by agricultural societies in every State of the Union. By this means not only could we have a supply of robes, in the indefinite future, but a healthful food.

### VISIT TO HAMMONTON.

The committee appointed to visit Hammonton and the Squantum marl pits, made the following report:

"Those acquainted with the resources and recent progress of New Jersey, find it difficult to bear patiently with the unwarrantable outside prejudice existing against her, or the baseless misrepresentations that prevail concerning the State and her people. The only just ground for either at this date is her railroad monopoly, which, by the way, is soon to be numbered among things of the past. Since the State has given satisfactory proof that the reign of local monopolies will soon be over, new towns have sprung up within her borders, and large tracts of land that a few years since were considered worthless have been practically proved to be productive under judicious management. The tide of eastern emigration that formerly flowed almost uninterruptedly toward the Far West has been partially turned into New Jersey, and to such an extent as to create no little newspaper alarm, lest the latter State would depopulate many of the New England towns. Among the most conspicuous of these new settlements may be ranked the town of Hammonton, situated on the Camden and Amboy railroad, thirty miles southeast of Philadelphia, and eighty from New York. It has been in existence about ten years, and it already has a population of from 3,000 to 4,000 inhabitants, principally from New England. On the 13th of June, the Farmers' Club of the American Institute accepted an invitation from the citizens of Hammonton, to visit their settlement, and witness the results of their ten years' occupancy of the 'Sand Barren,' formerly sacred to the scrub oak and pine. The undersigned, being appointed a committee to make a brief statement of the result of their observations during their two days' visit to this locality, report as follows:

"The soil is a deep, sandy loam, and in some instances so light as to be quite at the mercy of the winds. A moderate gale not unfrequently covers A's farm with an inch coating of neighbor B's sandy soil, to the former's serious detriment. This is more likely to occur on knolls and elevated lands, but on the larger part of the tract there is enough clay mixed with the sand to make the soil easily worked, and retentive of moisture and manures. The people mainly have made the culture of small fruits a speciality, and have at present 1,000 acres in strawberries, 600 of which produced a full crop during the past season. The variety is almost exclusively Wilson's seedling, cultivated in hills, the rows three feet apart, and the plants in the row, fifteen to eighteen inches. The runners are cut off as frequently as necessary during the growing season, and the beds or fields kept free from weeds by the use of the horse hoe. It is very unusual to see such a large tract of strawberries kept in as excellent order as those at Hammonton. The strawberry this year, in Hammonton, as elsewhere, produced a bountiful crop, and, on an average, yielded one hundred bushels to the acre, the maximum crop being, as stated to the committee, one hundred and fifty bushels. It was suggestive to notice 1,200 bushels of fine berries, packed in crates, ready for transportation. In view of the good old proverb that 'it is not wise to venture one's all in a single ship,' the inhabitants intend in future to pursue a somewhat different system, and devote more acres to the raspberry, blackberry, grape and early vegetables, for all of which the soil is well adapted. Asparagus and early tomatoes, for the New York market, can be profitably grown in the warm sandy soil of South Jersey. From the crops above named, Hammonton will realize her largest source of profit; but, if desired, general farming, or growing of cereals, can be successfully pursued on this class of soil. To confirm this fact, the committee have abundant evidence on the farm of A. K. Hay, Esq., in the vicinity of Hammonton, where they were shown large fields of winter wheat, oats, timothy and clover, growing on land that received only ordinary care. In a district of country like Hammonton, where the growing of small fruits is made a speciality, the subject of manures becomes very important. The popular fallacy that small fruits will succeed best on poor soil, has long since been refuted by intelligent growers. Where there are so few cattle kept as at Hammonton, every available article should find its way to the compost heap. Where this course is followed, every farmer can well afford to use a bountiful supply of marl from the inexhaustible Squankum pits. This Squankum marl is decidedly superior to the 'green sand,' and has given almost universal satisfaction when used in connection with other manures on the sandy soil of South and West Jersey. Many acres in this section that, fifteen years ago, were considered worthless, are now, by the above means, producing large crops. The committee were glad to see that the expensive system of fencing is rejected by the people of Hammonton; a wise rejection, since it is well known that the fences of West Jersey cost millions of dollars, and on an average have to be renewed every ten years. Were the soiling of cattle universal, wise legislation would soon do away with all necessity for fencing. Certainly, whenever the economical course is generally adopted, settlers will recognize an additional inducement to avail of whatever else may be offered. In conclusion, the committee are fully aware that with the intelligence, industry and enthusiasm exhibited by the people of Hammonton, success will surely follow."

P. T. QUINN,
J. V. C. SMITH,
N. C. MEEKER, } *Committee*
S. EDWARDS TODD,
THOMAS CAVENACH,

## MARL IN MONMOUTH COUNTY.

During the recent visit of a committee of the Farmers' Club to the marl pits of Squankum, in Monmouth county, Dr. Isaac P. Trimble, being called upon by the President of the State Agricultural Society to welcome the visitors, gave an interesting description of the marl deposit and its wonderful influence upon the agricultural productions.

The Squankum marl region, he remarked, is in Howell township, and the small stream running near is a tributary of the Manasquan river, the channel of which exposes, in many places, the upper stratum of the celebrated green sand marl. This marl has been found to underlie between five and six hundred thousand acres of land, forming a belt of several miles in width, and running across the State from Sandy Hook to the Delaware Bay, a distance of about ninety miles. It is not found anywhere upon the surface, but crops out in many places along the deeper water courses.

The green sand you see in those cars is marl. We have just passed large quantities of it piled up along the track of this railroad. This excavation is a marl pit. From yon rising ground—looking east—you may see scores of these pits. In the fall and winter, clusters of pyramids of marl may be seen in the valley of that river, looking not unlike the clusters of stacks of hay and grain in a neighborhood of highly cultivated farms. Hundreds of men and horses are at work there for months every year, forming a very busy scene. These are the pits of farmers living in all directions, from ten to fifteen miles round. I have been told that often eighteen hundred wagon loads are taken away in a single day. This has been going on for years—every year increasing. Thousands of tons are carted to Freehold, eight miles distant, and thence transported in cars to the counties of Middlesex, Mercer, Somerset, and even to Pennsylvania.

Marl, as you see, is apparently a mere sand, like other sands, except in color, but when analyzed it has been found to contain all the ingredients, and in the same proportions, as the ashes of straw —in other words, it contains the elements of the food of plants. Practical farmers have been testing its value as a fertilizer for many years, realizing the indications of science.

The following is an analysis of it:

| | |
|---|---|
| Water | 19.600 |
| Silica | 51.162 |
| Protoxid of iron | 18.200 |
| Alumina | 6.100 |
| Potash and soda | 4.274 |
| Lime | 3.478 |
| Magnesia | 2.037 |
| Phosphoric acid | 4.647 |
| Sulpherina acid | 0.629 |

The superintendent of the works here has shown us organic remains of animals of antedeluvian times. Petrified teeth of sharks —nothing of the original tooth remaining but the shell of enamel. These teeth are ten times the size of the shark's teeth of the present time.

All that remains of the bodies of the huge monsters of the sea are probably incorporated in this marl deposit, and adding materially to its fertilizing properties.

Revolutions in agriculture are slow. Farmers are cautious. It is said that a man lived in this part of the country some sixty years ago, who became thirsty for water, and dug a well. Some of the sand taken from that well was marl, and was scattered around upon the surface land. Clover came up where clover had never grown before. It grew thick and rank. That was the revelation of marl. Now it is used as a fertilizer upon thousands of farms. Lands not worth ten dollars an acre then are worth more than a hundred now, and there seems no limit to their further improvement. This revolution in agriculture is certainly marching on.

By common consent agriculture underlies all the other pursuits of life, and the question of fertilizers underlies all agriculture. Except in a few favored spots, the farmer who expects to prosper studies profoundly the subject of manures. He must have food for plants. Sulphate of lime at one time was largely used. Carbonate of lime is burned into crude lime at great expense. The bones of animals are gathered and ground. The droppings of birds are brought in ships from the islands of the South Pacific; the science of chemistry is producing fertilizing compounds more or less useful, and all these are found to pay, but they are all expensive and most of them only transient in their effects. Here is a fertilizer almost without cost, utterly inexhaustible, both quick and permanent in its effects, underlying a large portion of seven of the twenty-one counties of the State.

Here is a machine worked by a sixteen-horse steam engine, occupying little more space than the stable of one horse. It is a *dredge*, such as is used for digging out the harbors about New York. It floats in a canal of its own digging, and is now taking out a stratum of marl twenty-five feet deep. Look at it. There goes the mighty arm, lifting a shovelful into the cars—*a ton at a time!* And this can go on just so—a ton a minute for every hour of the twenty-four, every day of all the year, until not only all the farms of New Jersey, but the farms of outside barbarians also, can be supplied, and perhaps doubled in value.

A few moments ago I heard the chairman of our committee remark to our visitors that, "although this is Jersey, she is now in the Union." New Jersey in the Union, forsooth! Was she ever out of it? Who ever said so in the Revolution? Who dared say so during the late war? Out of the Union, indeed! In agriculture, New Jersey is the foremost of all the States by more than twenty dollars an acre, as shown by the census report of the value of farms. This disproportion is partly owing to our proximity to the great markets, but in a great measure to this green sand marl.

Those who were familiar with the desolate appearance of the worn-out farms of South Jersey, thirty or forty years ago, and especially in the county of Monmouth, would be amazed at their present appearance. Farms not worth the tillage then, teeming with abundance now—the *then* and *now* as unlike as were the fat and lean kine in the dream of Pharoah, and marl has been the chief agent in bringing about this wonderful change.

A farmer whose land will produce fair crops of clover, can grow fair crops of almost anything else, and is comparatively independent. Such a farmer may, by judicious management, double the value of his land during his lifetime, without the aid of other fertilizers than those of his own farm. But let him begin early in life to use either marl, lime, muck, or all combined, and also stimulate his crop by chemical preparations, as he finds them to suit, both he and his lands will rapidly grow rich together. But the man whose lands will not grow clover unless there is marl or some other fertilizer within his reach that will make clover grow, has starvation staring him in the face, and that continually. He had better be a woodchopper, and send his wife and children to picking berries in these "barrens," than to continue plowing.

Many, even in Hammonton, will tell you that they have tried marl on certain crops, and found no benefit. That is often true of all the manures. Some crops are benefited more than others, and often the seasons have their influence; but I would appeal to all such to try it again. Try it on grass and for potatoes, especially. Try that from Squankum, as it is generally considered the best. But here let me say that I must not be considered as disparaging the Pemberton or West Jersey marls. The results of their use in Burlington and other counties are ample to settle the question of their value.

The State Agricultural Society has done much to develop this marl question. A committee, with Prof. Cook as chairman, has carried on a very large correspondence with practical farmers, who have used marl largely for many years. Many of these letters have been published, and more will be, and the favorable testimony is universal.

I have just received a letter from Prof. Cook, regretting that he could not be with us on this occasion. The following is the conclusion of his letter:

"Our experiments with marl are successful beyond our most sanguine expectations; and such, I am glad to say, is the result wherever it is tried, quite to the south end of the State."

Much is said at this time about decreasing the length of a legal day's labor. Legislators are appealed to, to make such laws. Labor is often very hard; those of us who have worked sixteen hours a day in harvest time, know how hard it is. But it is a curse upon mankind, for which the Bible tells us our ancestors were responsible. We want comfortable houses; many of us want very fine clothing; and must have food—if possible we will have it three times a day. Now, when flour is almost twenty dollars a barrel, potatoes more than a dollar a bushel, and meats at starvation prices, as compared with the means of many, it appears to me we want more rather than less labor, and it must be so until we can have more human food. Then let us labor on, until we can have railroads that will spread *broadcast* such fertilizers as this all over our land; until more dredges like this shall be wanted to take out marl. No! intelligent, hard working farmers, increased application of fertilizers to the soil, and improved agricultural machinery, are the proper legislators to appeal to, to settle the *labor* question.

### SOUTH JERSEY.

Mr. A. Hogerboom, Newfield, Gloucester county, N. J.—Never, perhaps, did geographers blunder more than in stating South Jersey to be "a pine barren." Farms in Gloucester, Cumberland and Saleen counties, that have been decently farmed, certainly give the lie most emphatically to this. I have traveled over much of Jersey, and know whereof I affirm. As we recede from the Delaware, in the direction of the Atlantic coast, we shall find the soil gradually becoming more sandy. But, for at least half the distance across the State, with the exception of here and there a circumscribed locality, it is good farming land, if judiciously farmed. But what is of most importance, and regarding which we want line upon line, and precept upon precept, is the utility of deep and thorough cultivation, and of clover. Little is really known of the value of clover as a fertilizer, to say nothing of its value as a crop. As for deep cultivation, I have my method, which is very simple, to be sure, of bringing this new land under cultivation, and at once converting it, as it were, into a garden, but it is not by plowing among the stumps. Adjourned.

## July 16, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### MANAGEMENT OF GRAPE VINES.

A letter was received from O. M. Hamilton, Brownville, Ohio, stating that in 1865 he planted twelve Concord grape vines. The first winter he cut back to two or three eyes; the second, so as to leave two feet of new wood. Last spring he trained them on a trellis, raised from six to eight canes, pinched out the laterals, and now there are from twenty to thirty large clusters of fruit on each vine. The question is, how he shall proceed for next year.

Mr. Wm. S. Carpenter.—With the Concord one can hardly make a mistake. With other varieties this course would be fatal. I saw a Delaware vineyard ruined by pursuing this course. In the spring one should raise two canes, which are to be grown for the bearing wood of next year. A three-year old Concord vine should not be allowed to bear more than from twelve to fifteen bunches. A Delaware not more than six or eight.

Mr. J. S. Burgess recommended to remove some of the canes as soon as the leaves have fallen in autumn; after this, to dig up the soil around each vine, and apply a liberal dressing of liquid manure. This treatment, he thought, would secure a good and healthy growth.

### BARREN RYE.

Mr. James H. Bell, North Nassau, N. Y., sends a number of heads of rye, with very few, and some containing no kernels, and asks what he shall apply to the soil.

Mr. S. Edwards Todd.—It looks as though his ground has been so impoverished by a long succession of exhausting crops, that there is no material left in the soil for producing the kernels of grain.

Mr. W. P. Peck said one of the first things that should be done, is to renovate the soil by an application of bone dust, or wood ashes.

### STRIPED BUG.

Mr. Jonas Hopkins, St. Joseph, Michigan, writes that a perfect remedy for the striped bug, is to put a hen and chickens in a coop near the cucumber vines.

Mr. Wm. S. Carpenter stated that hens and chickens are not essential, as the bugs cannot descend into a box. Therefore, a box will exclude the bug most effectually.

Mr. J. M. Allen said he makes small boxes, and covers them with a pane of glass.

The Chairman said that old cheese-boxes can be bought for five cents each; they will last for years, and are better than anything else.

### GAPES IN CHICKENS.

Mrs. J. K. Hartsler states that, by feeding her chickens corn cake, made of coarse cornmeal and water, she had found a remedy for the gapes.

Mr. Wm. S. Carpenter.—I feed my fowls cracked corn, and they are never troubled with this disease; but besides this, I take the pains, every year, to get a male bird from a distance. There is scarcely a doubt that the great majority of the diseases of poultry is owing to breeding in and in.

### SUGGESTIONS ABOUT PREMIUMS.

Mr. E. Williams, Montclair, N. J., communicates some sensible suggestions in the following letter, which judges of fruit should ponder. He writes:

"Being practically engaged, as the old adage has it, in 'making hay while the sun shines,' prevents my being with you to-day at the meeting of the Club in person; but my spirit has been with you, and now culminates in a few thoughts on strawberries, suggested by an empty dish at my side, and the remark, 'the last of the season.' All who went with us to Hammonton certainly had visions of strawberries, if they did not dream of them, and we have also seen several amateur collections, besides taking a look at those shown at our late exhibition, all of which tend to give us a little idea of the extent of the experiments and efforts being made to improve and perfect this delicious fruit. Nurserymen, fruit-growers, amateurs and professional men are all engaged in this pursuit, each hoping to find, if not actually confident of having found the 'philosopher's stone.' The liberal prize offered by Mr. Greeley was very apropos just at this time, and will tend to bring out and develop the success and progress already made. This is evident from the number of competitors at the exhibition on the 26th inst. But it is very evident, and I think you will agree with me, that the exhibition tables are not the place or the time for a committee to make an award of this nature.

"They can readily and appropriately award a prize to the best appearing or flavored variety, as shown; but the conditions on which the prize is to be awarded are not to be had there. Neither would it be practical for the committee to visit the grounds of such as desire to compete, scattered as they are over so wide an extent of country. The loss of time and expense involved by such a course would be more than ought to be imposed on any committee; besides, they could not see what 'extra pains,' 'special means,' 'specific fertilizers' or 'hocus-pocus' agencies had been resorted to, to produce the desired results. Hence their decision, under such circumstances, must be based on the testimony of others. But there is one way, and but one to my view, by which the object sought can be gained, and a just and fair award made, and that is for the committee to grow and test the different varieties on their own grounds. By this means they can make a thorough examination of all the various points involved, and have ample time to do it; all of which is absolutely necessary to do justice to all parties, and to benefit those most interested. The people, presuming this matter to be in charge of the board of managers, it is only within the province of the Club to suggest such a course as to them seems most likely to secure the object sought. My choice for two of that committee would be Charles Downing and J. J. Thomas, and the balance should be 'like unto them,' men who have no private ends to serve—only *pro bono publico*."

### PAGE'S PUMP AND SPRINKLER.

Mr. N. Page exhibited a small pump and sprinkler. This pumps water from a pail, tub, or barrel, in a fine mist, or in a single jet, over a space of two inches or ten feet, and, if needed, forty feet high. It is recommended for gardens, for washing windows, buggies, and a great variety of uses.

### WHITE'S COMBINED WASHER AND WRINGER.

The clothes are pressed between two rubber blocks and are subject to alternate compression while held by the hand; when let go they go forward and pass out through a wringer, and the whole work is completed by the continuous working of a crank. As the process only showed the movement of a cloth that was clean, it was referred to Mr. Wm. S. Carpenter and Dr. Hallock, to associate with them a committee of ladies to try the machine and make a report.

### SHERWOOD'S COTTON-SEED PLANTER.

Mr. N. B. Sherwood brought a one-horse planter into the room, and put it in operation, by dropping cotton seeds on the floor, in a row, to show the operation of the machine when planting seeds in the field. It will distribute from one to four bushels of cotton seed per acre. The machine is drawn by one horse, is held and guided by two handles, similar to plow handles; a tooth opens the furrow, into which the seed is dropped, after which it is covered and the ground rolled over the seed, all at one operation. Its weight is 175 pounds. The inventor said, it is in practical operation in Tennessee. The members thought favorably of it, but, of course, could pass no opinion without seeing it work.

### NEWMAN'S PROPAGATING BOX.

Mr. E. C. Frost, Watkins, N. Y., was then introduced to talk about propagating boxes and flower pots, in which cuttings are propagated. He greatly prefers boxes to pots. For this purpose he makes boxes of wood, the sides of which are about four inches high, of half-inch material, and about two feet long. The boxes have no top nor bottom, and are very narrow, and open at one end, so that a plant and the contents of the box can be transplanted into the open ground with much greater facility than it can be done out of the flower pot. As the boxes are long, roots can grow to a much greater length than in pots. Ribs of wood are nailed across the inside of the boxes, to turn the roots inwards across the box.

Mr. Wm. S. Carpenter said he was much pleased with it, for in transplanting there could be no loss.

### A VISIT TO A RASPBERRY PLANTATION.

The committee made up at the last Club meeting, visited the farm of Mr. Samuel Sinclair, on which they found the raspberry field managed by Dr. W. B. Peck. The variety growing is the Doolittle black cap. They were planted in drills, the rows about seven feet apart, and were literally loaded with fruit. Perhaps this is the finest display of this variety grown in the vicinity of New York, for the shipments bring the highest price. The location of the place is one of the most beautiful of the many beautiful ones on the banks of the famous Hudson. Good crops were on the ground, and it was an interesting sight to see two beautiful ponds containing many speckled trout. Mr. Sinclair is building a concrete barn, which, when completed, will be the best in the country; and he is otherwise improving the place by draining and getting out muck.

### SPUR-PRUNING THE GRAPE.

Mr. C. Taber, Brooklyn, L. I., writes that he trained a portion of his young Concords upon the alternate renewal plan, and the others to the spur, or entire renewal system, with results decidedly in favor of the former. The arms were the same in each, and after training uprights, eight inches apart, on a portion of this trellis, every other upright was cut out in the fall to one bud, and now the remaining canes, or the shoots from them, are well loaded with fruit, while there are few clusters on that part of the trellis where every upright was cut down to two eyes with the expectation that each of the new shoots would have several clusters. They seem too ambitious of growth to attend to the bearing part. If they do not yield better after one more trial, he proposes to bring them all to the alternate renewal plan—that is, cutting away each alternate upright to a single bud after it has yielded a crop of fruit—the intermediate canes growing in the mean time for fruiting the next year. Possibly, the rank-growing Concord, on a rich soil, will not bear this close cutting. What say the experienced growers of the Club?

### PLANTING GRAPE CUTTINGS.

Mr. D. Newbro, Lansing, Mich., writes: "Three years ago last spring, I planted about one hundred Concord grape cuttings. I dug a trench about sixteen inches deep and six feet wide; covered the bottom with straw, corn stalks and coarse stable manure, to the depth of two or three inches, then tramped down; then filled the trench with the soil that had been taken out. In this the cuttings were planted, in rows nine inches apart, and about five inches in the rows. Then covered the ground between the rows with boards eight inches wide, leaving an inch space between the boards occupied by the cuttings. The object of the straw and corn stalks was for drainage more than manure, and the boards to prevent evaporation from the surface. The result was that nearly every cutting grew, and made canes from two to six feet, and roots in very great abundance, one to four feet long. Every spring since, I have planted with equally good success."

### CLOVER IN NORTH CAROLINA.

Mr. Edward W. Poro, Southfield, N. C.—Will the Club assist us by giving the most approved method of putting in clover, suited to the latitude of New York city, including quantity of seed and time of sowing? In addition, we would be obliged for any suggestions as to changes proper for the latitude of Raleigh. What do you mean by soiling cattle? We pull fodder in August, and it is terrible work for Christians, and poor pay. You Northern people cut down the maize stalks. Do the blades, exposed as long as you leave them in the fields, make good forage, and is the corn not damaged for bread or pudding? Our pine forests will, one of these days, give out, and barrels of turpentine cease to roll down to Newbern and Wilmington. But our children will then furnish the world with as many barrels of *Scuppernong juice* as we now produce of spirits of turpentine. Come down and plant vineyards with us.

Mr. N. C. Meeker.—Clover should be sown in North Carolina at the time of sowing oats, and should be brushed in after the oats. The land should be good, though it will grow on fair corn land. A little manure will be certain to give it a start. Six quarts to the acre will be fair seeding for that climate. It can be sown without any other crop. A good way is to sow on fall wheat in February;

if there is snow on the ground, one sees better what he is doing. It should neither be cut nor fed till the second year. After it gets firmly established, it will furnish immense feed and fodder, and the best wheat can be grown by turning it under green. To keep cattle in the stable and bring the green feed, either of rye, corn fodder, roots or clover, is called soiling. It will seldom pay, except where land is worth one hundred dollars per acre, or where one cannot turn on a field. Pulling fodder is heathenish work, as we very well know, and never would submit to it. When we cut up corn, we wait till it is glazed, and we generally think the quality is improved. We put it in stooks or shocks of about fourteen hills, though in the South, where there are seldom more than two stalks to the hill—often not more than one—more than fourteen hills might be taken. The fodder is very good. Many have machines for cutting up the stalks and blades; to this is added bran or corn meal. The man who will show North Carolina people how to grow clover will be a public benefactor. It ought to be worth as much to the south as the cotton crop, for the reason that cotton, wheat, corn, and all other grain will grow heavily after it. To put a farm in clover adds ten dollars in value to every acre. Let the one who would try it take an acre, first put on manure, if needed, plow thoroughly, harrow fine, and sow. Don't pick out poor, wasted land, but take the best you have. From clover comes manure; with clover millions of worn-out Southern acres, in time, can be made as choice as the Mississippi bottoms.

### CURRANTS IN TREE FORM.

Mr. E. Pratt, Geneva, Ohio, writes that he agrees with the Club that fairer and better currants and gooseberries can be produced by training the bushes in the form of a tree. He says:

"In the spring take good, thrifty limbs of the bushes, bend them to the ground, and insert the top into a hole, as near perpendicular as possible, and cover them with fine earth. In August, cut them from the parent stalk. They will be well suited by that time. The next spring transplant. They will grow like a tree; the fruit will be much larger and better." He has tried this method with success.

Mr. Wm. S. Carpenter said he has no confidence in the system, although he has not tried it. He said the currant will produce fruit for only a few successive years. Mr. Lawton coincided with Mr. Carpenter.

Mr. E. C. Frost said we never propagate the currant by layers. It is better to cut out the old wood every year, so as to renew the bushes occasionally, than to attempt to produce fruit on tree-shaped bushes, as it is not an economical way of growing currants on trees.

### INSECTS ON GRAPE VINES.

Mr. A. R. Strangham, Waterloo, N. Y., sent an account of the ravages of insects on his grape vines, with some specimens of insects, all of which were referred to Dr. Trimble, of Newark, who stated that the destruction of the vine is the work of caterpillars, which must be destroyed by birds or by hand. At this season of the year the worms are numerous on some vines, and they must be destroyed, or they will kill the vines. Adjourned.

## July 23, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary,

### KEEPING GRAPE CUTTINGS THROUGH THE WINTER.

Mr. Lauran Mallard, Lawrence, Mass., asks the Club the best way to keep grape cuttings through the winter?

Mr. Wm. B. Harrison.—In Northern Ohio, it is a common practice to bury them close together in dry soil, where no water could settle, and cover with straw and earth.

Mr. N. C. Meeker said that they would keep well in a dry cellar, covered with moss. It is important that the cellar be dry. If packed in a box with moss or a little straw, they do well; but they need watching. To heel them in by the side of a large log, where it is dry, or in a dry garden, they keep well.

### BEST POTATOES.

Mr. T. R. Jones, of Virginia, inquired which are the best potatoes for general cultivation? The Goodrich had not done well with him. He was trying to raise the best of every variety of farm product, but was in doubt regarding this root.

Dr. Hexamer.—I can state the results of my experience, which has been quite extensive, but as my soil is clay loam, it may not be applicable to Eastern Virginia, much of which is sandy. On the whole, the Early Cottage does best. On light soil the Dykman does well. The Early Goodrich rots some. The Cusco is most productive, but it is not first rate in quality. The kind growing largest is the Monitor—quality not high. To my taste I like the white Mercer best. For a late variety, and which will keep well, I prefer the white Peach Blow. I am much pleased with the Early Cottage for summer use.

## TRANSPLANTING FOREST TREES FOR SHADE.

Mr. D. Bishop, Leavenworth, Kansas.—Many more people would go on new farms if the prospect for having shade trees were not so distant, and I would like to know if there is an easy way of transplanting them.

Dr. J. C. V. Smith, Boston, Mass.—I can tell you what is doing in Paris, where they are making many new streets. No sooner is a street completed than trees taken from the country are brought in on large drays, and immediately there is shade through the whole extent. At Nahant, near Boston, Mr. Tudor buys all kinds of trees, where improvements are going on. He even takes old fruit trees, and carts them from seven to nine miles, and they do well and bear fruit. When Daniel Webster bought his farm at Marshfield, and he was commencing to make improvements, I begged the privilege of removing some large plum trees which were in a back lot, and which they were going to cut down. This being granted, I hired a number of men, and in the dead of winter we went and dug around in a diameter of eight feet, and with pries we took up a mass of frozen roots and earth two and a half feet thick. They were transported seven miles. Next spring they blossomed and bore fruit, and have continued to do so to this day.

Mr. Wm. Lawton, New Rochelle, N. Y.—In front of the new hotel, at Saratoga, they have transplanted trees a foot and a half in diameter. Mr. Tudor, at Nahant, protects his trees by a paving of flat stones. Once he planted a peach orchard, and covered it over with a roof of boards. Nothing is more certain than that large trees can be transplanted with great facility. Every branch has a corresponding root, and for as many roots as remain branches can be retained. This year, in making improvements, I have transplanted nearly twenty large evergreens, of native and foreign varieties; some of them are twenty years old, and have branches close to the ground; and, though the work was done only two months ago, a stranger could not detect the removal. I dug a trench around the tree, and had a dray and three men. People lose a great deal of time by not transplanting trees. Still, I would not neglect to plant small trees, for they are as beautiful as large ones. Trees are comparable to children. I like as much to see an evergreen or other tree two feet high, as a child two years old. Still, when one is advanced in life, he can have neither old children or large trees, all at once. To transplant large trees pays better than paint, carpenter work, or any other kind of improvement. In taking up large trees, in a loamy soil, it is not necessary that the ground should be frozen, for enough soil will adhere to the roots.

Dr. Jarvis.—No tree of any size should be transplanted with less than three feet of soil each way, from the trunk, or six feet in diameter. Again, many fail because they dig small holes, and do not have the soil thoroughly disturbed. In the Central Park, the ground was generally loosened, and all the trees have made an astonishing growth. As a substitute for trees, one can train morning-glories and other Western running vines and creepers, which will be pleasant while trees are growing. In planting, it will be a great advantage to have broken pots, and various stones, particularly old, or other red sand-stones, to attract the moisture which the tree requires. Rocky hill-sides are good for grapes for this reason.

Dr. Halleck.—I have learned, from experience, that the placing of stones around trees newly planted insures a successful growth. Shrubbery should be treated in the same way.

Mr. Hyde.—In the West we remove the snow in February, that the ground may freeze; after that we remove the tree in a solid block of frozen earth. We are particular to do one thing, and which should not be neglected. This is to mark the tree, say on the north side, so that in resetting it may stand to the North, for this side is the toughest. By neglecting this precaution, many trees die, since if the south side, which has thinnest bark and is tenderest, is placed to the North, it is not able to withstand the cold.

Dr. Peck.—I recommend that, to save labor, the tree be dug around in the fall, that in the winter, with very little labor, it may be cut off and placed on wheels, ready for transportation. It is no small job to take up a tree while the ground is frozen solid.

Dr. Bradshaw asked if it was necessary to transplant trees with the same side to the North as it originally grew. It had been stated that this is important, as the trees will succeed more satisfactorily than if the south side be set to the North, or at some other point of the compass.

Mr. Wm. S. Carpenter stated that the subject has been ably discussed and experimented upon by practical horticulturists, and no difference can be perceived in the growth and thrift of a tree, whether it is transplanted as it grew or otherwise.

Dr. Richards stated that he had read the treatise of a Mr. Stuart, an intelligent Scotchman, who had made numerous interesting experiments on this point, and he found that his success was not at all affected—either for or against—by placing the side of the tree to the North that originally grew on the north side.

Mr. R. G. Pardee thought that there is no practical advantage in observing the suggestion to plant trees in this manner. The main point of difficulty in transplanting trees is, three-fourths of them are stunted by being badly planted. Most people crowd the roots of their trees into a small hole, instead of spreading them out as they naturally grew. The result is that you can scarcely find a tree anywhere but what its growth is stunted, after having been transplanted in this manner. If more care were exercised in transplanting trees, more satisfactory success will follow. If men who are about to plant trees would pay an experienced gardener twenty-five dollars to show them how to put out a tree correctly, they would be gainers in dollars and cents.

Mr. Wm. Lawton admitted that, under certain circumstances, it might be advantageous to transplant a tree different from what it originally grew.

### PRONG HOE.

Dr. Hexamer, Newcastle, N. Y., exhibited one of his prong hoes, which somewhat resembles a potato hook, but it is larger and lighter, and has a number of tines, and is so made that the tines can be replaced if broken.

### VALENTINE'S PATENT SHEARS FOR PRUNING AND GATHERING FLOWERS AND FRUIT.

Mr. Wm. B. Peck exhibited, and distributed among the members, a dozen grape and flower pickers, which are similar to scissors. A spring on the flat of one of the blades holds a bunch of grapes after it is cut from the vine, so that one can carry it to the basket. Hence one holds the scissors in one hand and the basket in the other, and works rapidly. The invention is very ingenious, and received the approbation of the members.

### NEWCOMBE'S FRUIT PICKER.

Mr. S. Edwards Todd exhibited one of these pickers. It is simply a pair of jaws, with a cutting edge at the upper end, which cuts the stem of the fruit; this is placed on a long pole, and has a bag attached, into which the fruit falls. The inventors are Misses Newcombe, No. 33 West Twenty-seventh street. When the ladies were mentioned, there was general applause, for this was the first invention by ladies that has been presented to the Club—and lady inventors are very few.

### CRANBERRIES FROM TOM'S RIVER, N. J.

Mr. Wm. W. Applegate exhibited a beautiful hill of cranberries grown on his place.

Mr. S. Edwards Todd stated that it is a specimen of many acres now growing. Formerly, the ground was a swamp. First, the wood on it sold for $400 an acre. Then the ground was planted, at a cost of $300 an acre, when it was sold for $1,200 an acre, and paid for with two crops of the fruit.

### CLARK RASPBERRY.

Mr. Charles P. Auger, Whitneyville, Conn., and Mr. Lyman Bassett, North Haven, Conn., exhibited specimens of the Clark raspberry.

This is a new variety of the red raspberry, originated at North Haven by Mr. Lyman Bassett. The chairman said it was enormously productive, growing on long spurs, and its fruit delicious.

Mr. Wm. Lawton thought it was altogether too soft to send any distance to market.

Mr. N. C. Meeker.—It is certainly valuable for family use.

### SENECA BLACK CAP.

Messrs. Doolittle & Wright, Waterloo, N. Y., exhibited this fruit. It is of large size, and is claimed to be from eight to ten days later than the Doolittle black cap. A handsome crate, of twelve boxes, of the fruit was shown and distributed, and enjoyed equally with the others. If it is as late as stated, it must be a valuable addition to our raspberry list.

### WASHING FLUID.

Mrs. M. W. Hayward, Natick, Mass.—Some of my neighbors have been paying a dollar for this receipe for washing fluid: Two pounds of sal soda; three-fourths of a pound of unslacked lime; two gallons boiling water. Let it stand till perfectly clear, then put in bottles. Soak the clothes over night—half pint fluid to a boilerful—soap them and boil an hour. It is good.

### GRASSHOPPER OR LOCUSTS.

The Rev. James French, St. Louis, Mo.—They remain only one season in a place. As soon as they shed their skin they have wings, and then they emigrate eastward, filling the air so full that their wings, glistening in the sun, resemble a snow storm. They have been known to destroy a field of young wheat in one day. They eat red peppers, tobacco, weeds, almost every kind of vegetable. Twice these insects stopped the cars by oiling the track. I have seen the Missouri river nearly bridged across with them. They were in Colorado a few years ago, and traveled eastward a few hundred miles each year. Next year, or the year after, they will probably destroy the crops in Illinois.

### DEATH OF JOHN G. BERGEN.

The Chairman, Mr. Nathan C. Ely, then arose and read the following preamble and resolutions on the death of Mr. John G. Bergen, accompanied by eulogistic remarks:

"The Farmers' Club of the American Institute, deeply sorrowing for their loss by the death of John G. Bergen, one of the founders of this Club, and for a long term of years an almost constant attendant upon its meetings, ever ready to give to all the benefit of his large experience in agriculture and fruits, and by his strict integrity and immovable firmness in upholding what was right, and, as we believe, having 'charity for all, and malice for none,' we feel that this sad event should not pass without some record of it in our proceedings; therefore,

"*Resolved*, That the Farmers' Club of the American Institute, and the great interests of agriculture, horticulture and pomology, by the death of John G. Bergen, have lost a most earnest, experienced and devoted friend.

"*Resolved*, That by his death the community have lost a capable, honest, and upright public officer.

"*Resolved*, That we desire to mingle our tears with his sorrowing family, and yet we doubt not that our loss is his gain, that as he was faithful in the discharge of every duty on earth, he will receive an eternal reward.

"*And be it further Resolved*, That out of respect to our departed associate, the Club will now adjourn."

Mr. William Lawton.—I have often met Mr. Bergen. He was a representative of the old school of Long Island farmers, and of a population now almost extinct. They lived by their business, and were proud of it. Only two months ago I called on him in the family circle, and found him interested in the discussions of the Club, although he was suffering from disease, and this led him to speak of his pear trees, and of the vines around his dwelling. In this fast age of fast people, I wish to honor him of whom I speak as belonging to the old school of farmers, who delighted in the cultivation of the soil.

Mr. J. W. Richards offered the following resolution:

"*Resolved*, That the Secretary be instructed to enter the above resolutions on the minutes, and transmit a copy to the family of the deceased."

The resolutions were unanimously adopted. Adjourned.

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## July 30, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### BLIGHT ON APPLE TREES.

Mr. Erastus Snow, Grinnell, Iowa, sent a letter and a few twigs and leaves from one of his apple trees, requesting information concerning the blight of his own trees and the trees of his neighbors.

The subject was referred to Mr. Wm. S. Carpenter, who stated that he thought it the work of insects.

Dr. Isaac P. Trimble took the twigs, and upon examination discovered insects at work in them.

### THE WILSON BLACKBERRY.

Mr. William Parry, of Cinaminson, Burlington county, New Jersey, exhibited some beautiful blackberries of extraordinary size and productivity. The variety is a new one, and is just being brought into public notice. He considers it the largest, most productive, and altogether the best blackberry that has ever been grown. It was raised from a wild berry found by Mr. John Wilson, and bears his name.

Mr. Wm. Lawton was very glad to welcome a new variety which, in some respects, was superior to the Lawton. The Wilson was considerably earlier, and this was a great advantage.

Mr. Wm. S. Carpenter spoke very highly in favor of the new berry. It was one of the most valuable acquisitions to the blackberry crop that had ever been made. It was from six to seven days earlier than the other varieties, and this feature would be hailed with great satisfaction by all consumers of fruit. Every one who has a garden should have the Wilson blackberry, and it should be followed up by the Kittatinny, another most valuable acquisition in the way of blackberries. It was first in size, and first in productiveness, and first in quality, in which latter respect the Wilson was somewhat deficient. It was very hardy, and would stand out severe winters without deterioration.

### GRAPE BOXES.

Mr. Wm. B. Harrison exhibited a new grape and berry box, made by the Berlin Heights Manufacturing Company, Erie county, Ohio. It is intended to furnish the stuff to the fruit-growers, already cut and fitted, and let them nail it together. The inventor says that 25,000 of these boxes were used on the shores and islands of Lake Erie last year.

### BREAD MIXING MACHINE.

Messrs. F. F. Forbush & Co. exhibited one of their machines. It is turned by a crank, to which is attached cog-gearing, which works two upright parallel rollers, that turn in a tin circular pan and knead the bread.

### HAIR FELT FOR ROOFING.

Mr. M. A. Johnson, Lowell, Mass., exhibited specimens of hair felt. It is recommended for durability, and adapting itself to the shrinking and swelling of the roof, and also for making a house cool.

Dr. Jarvis thought that the moths would cause its destruction after a few years.

### CORN AND COTTON STALK CUTTER.

Dr. Jarvis exhibited a model of a machine for cutting corn and cotton stalks, which he had invented. If this machine will do what is claimed for it, it must come into general use.

### DIRECTIONS TO A YOUNG FARMER.

Mr. W. J. Lambert, Brooklyn, L. I., states that he has just bought thirty acres of land, but, having been brought up in a city, he wished the Club to inform him what books and agricultural journals would give him the desired knowledge.

Mr. N. C. Meeker.—I advise him to hire a man who understands farming well, put him to work on his place, and then go to work under his directions. I do not believe in book-farming, as it is generally understood.

Mr. Wm. Lawton, of New Rochelle.—Within a few years a great number of good books have been published. One is Allen's, and for twenty dollars he can get "Loudon's Encyclopedia," which will give a vast sight of information, and these he can read till he gets weary. Still, I would say that if three-fourths of the books on farming were burned, we would be better off.

Dr. Isaac P. Trimble.—I have been through the mill of reading books to perfect myself in farm work, and have received very little good. If one is to be a lawyer or doctor, then he wants books. It is the practice in Philadelphia, when young men turn farmers, to go to the country and hire out a year or so to good farmers, and then they learn something about their business. This young man is entirely on the wrong track. He had better sell his land than to undertake to learn how to work it from books. We have had a great deal of impracticable knowledge within a few years; I say altogether too much. There is the author of "Ten Acres Enough;" he lives in Burlington, and only occasionally goes into the country, and does not understand what he pretends to teach.

The Chairman.—That book has done much good in showing people that they need not despair if they have only a few acres. It has induced many people living in cities to go to farming, and in the end to improve their condition.

Mr. Wm. S. Carpenter.—If we never read we will never learn. Without reading, one will be in the background. I would advise the young men to read both agricultural and horticultural journals. A few experiments will correct his errors.

Dr. Isaac P. Trimble.—A young man studies text-books for a profession. After that he can turn to miscellaneous reading. We know that books are multiplied without knowledge. It should be understood that farming is undergoing a change. Machinery, more and more, is doing hand and back work.

Dr. J. E. Snodgrass.—I think a great mistake is made when scientific agriculture is discouraged. The time has come when the denouncing of book farming must end. The spirit of ingenuity governs the land, and it will not do to cling to old and exploded notions. A doctor's student properly commences by reading books on the science he is to practice. Solon Robinson's "Facts for Farmers" is a most useful book.

Mr. N. C. Meeker.—I would not say that books on farming are not important. A farmer is not likely to be worth much unless he reads. But it is equally important that he should know how to work. It is illogical to compare a young farmer to a medical student. Books are the doctor's tools. Plows are the farmer's tools. A man may sit by the side of a shoemaker and see him put bristles on waxed ends year after year, but he will not learn to do it till he tries to do it himself.

Mr. T. W. Hard, Arlington, Vt., inquired whether currants are poisonous if grown on bushes from which the leaves have been eaten by worms. Some supposed cases of the kind were reported in the writer's neighborhood.

Dr. Isaac P. Trimble.—This is the first I have heard of such a result from such a cause. Still, there is no doubt that fruit growing on diseased branches is not proper food.

The following reports were next read and accepted:

### SPEAR'S PRESERVING SOLUTION.

The committee to whom was referred Spear's fruit preserving solution, respectfully report:

"That they have examined a number of jars of fruit and vegetables preserved by means of this solution. They must frankly state that the peculiar flavor of the natural product was not in all cases retained. In some samples, however, such as the strawberry, and the tomato, the characteristic taste was more obvious.

"As to the preservative power of the solution used by Mr. Spear, there can be no question. Fruit can be kept without undergoing fermentation or the chemical change producing acidity, for a very long time, when immersed in this solution. The inventor claims that it prevents the decomposition of animal as well as vegetable organisms.

"Sulphurous acid has been found to be a valuable anti-septic and deodorizer. It destroys the offensive character of the emanations of putrefactive products. During the progress of the cattle plague in England, it was found to be efficient in destroying the vitality of the germs which are supposed to be the cause of that disease. It has a powerful deoxydizing action and gradually changes into sulphuric acid. When neutralized by an alkaline base, forming the salt, its anti-septic power does not seem to be impaired. According to Crookes, sulphites of this class, if allowed to remain in the open air, in contact with moist organic matter, are gradually decomposed with an evolution of sulphuretted hydrogen. This action must be guarded against when such a salt is used in preserving meat, as prepared by Mr. Spear.

"It seems a plain proposition to your committee, that a solution of a sulphite which has such power to destroy the offensive effluvia of decaying animal matter, has some influence on the delicate and delicious odors and flavors of fruits submitted to its action.

"Whether, by using a relatively small quantity of this salt in solution, the exact point might be attained which would arrest further change in the fruit and yet leave sufficient of its original flavor to make it attractive and agreeable to the palate, is a question which your committee would not attempt to answer without making a long series of experiments.

"They cannot, however, overlook the valuable medical virtues of the solution used by Mr. Spear, and it seems to them a matter of such general importance that special notice should be taken of it in this connection, although the patentee of the process makes no mention of these curative properties.

"The salt in question does not belong to that class of medical agents which exercise a deleterious influence on persons in good health, and yet, in a certain class of diseases, it acts with great curative power. It has been used with success by physicians of the allopathic school, both in this country and Europe, in diseases by blood poisoning. Dr. DeRecci states that sulphites of the alkaline class neutralize the zymotic principle, that is, the ferment, without being injurious to life.

"In this country, at least, the disease most to be dreaded is scarlet fever. It has been successfully treated, in many cases, by means of the sulphite of soda. The question now presents itself whether the use of fruits prepared by Mr. Spear's process, among children, would not have a beneficial tendency? We assert with confidence that a preventive and cure of this terrible scourge could not be administered in a more palatable form than that of preserves.

"If Mr. Spear's solution should prove a specific cure for the disease alluded to, as well as others of a similar character, the demand for it will be far beyond what the inventor could have hoped, if used simply as preservative of fruit.

SAMUEL D. TILLMAN, } *Committeee.*"
J. V. C. SMITH, }

### PAGE'S PUMP AND SPRINKLER.

The committee to whom was referred Page's pump and sprinkler, beg leave to report:

"That they have carefully examined and practically tested the same on the various points claimed bv the inventor. The implement is of very simple construction and not liable to get out of order; the stream of water from the nozzle is directed by a piece of rubber attached and regulated by the finger of the operator; they find it admirably adapted for watering plants in pots, syringing the leaves of the most delicate plants, and watering plants in every stage of growth.

"Fruit growers will find this little pump of great service in washing trees and vines. It saves a great deal of labor in carrying water from place to place, as the water can be thrown a considerable distance, either in a stream or mist.

"It will also be found useful for a great many domestic purposes, such as washing carriages, windows, &c., and from its cheapness should be put in the hands of all who have a use for such a convenient article.

S. EDWARDS TODD, }
JOHN W. CHAMBERS, } *Committee.*"

### WASH FOR APPLE TREES.

Mr. V. Hyde, Trumbull county, Ohio.—Eight years ago we bought a farm with two orchards; they were almost without fences, and the cattle had injured them so that they presented a decaying appearance; many of the trees were dead; one of the orchards we almost concluded to cut down, but finally bought trees and filled out both orchards; we plowed the second one and manured both, trimmed the trees and washed them twice a year—in the spring and fall—with weak lye, and the effect was soon evident; the old trees grew thrifty, and the young ones rapidly, and now we have plenty of apples.

### TIME TO CUT TIMOTHY.

Mr. Seth Wetherbe, Jacksonville, Morgan county, Illinois.—I have been a practical hay farmer many years, and have both fed and pressed for market. I have found that the best time to *cut* is when one-third of the heads are brown. The seed at that time is in the dough, and before you can get it up it will shatter enough to seed the ground a little, which is necessary to keep the meadows in a healthy condition, and which, in this way, can be done for any length of time. I had in my farm twenty acres which have been in hay for twenty years, and the last five years the yield was one and a half tons per acre. I never cut any part of it two years in succession, without the seed shattering some. It was upland; I never put any manure on it, and never fed any of the hay on the land. I know, by experience, if you cut when in bloom, for three years in succession, it will die out, and nothing but blue grass will be left. In pressing my hay, I found that I made the heaviest bales of hay on which the seed had matured, and the bales had a brighter and better appearance than those pressed from hay cut when green. I think there is fully a loss of twenty-five per cent in cutting hay when green, in the weight, and certainly there is a third more work before you can get it up in spreading, and the risk of getting it damaged by rain. In seeding for meadows, I would recommend to mix at least one pound of clover-seed to the acre. In our climate, if it should be dry and hot after cutting our meadows, the sun injures the roots of timothy, as it does not sprout up readily; but the clover, being a top root, will come up and protect the timothy roots. Moreover, I think you will get quite as much timothy, or more, than if your timothy was alone on the ground, and a much better after-growth for fall feed.

### MINK PARK.

Mr. A. A. Mudget, Great Valley, Cattaraugus county, N. Y.—You wish to know how to start a mink park, and what kind of business it is. I have kept mink for the last eight years. I have from thirty to sixty per year; could raise any quantity if I could get fish or fresh feed for them. Any board fence, four feet high, if the mink are properly trimmed when four weeks old, will confine them. Their fur can be made two or three shades darker than the wild mink. Twenty-five or thirty are as many as a farmer can keep, as all the feed we can get is woodchuck. You mistake as to the number I keep; I did not state five hundred; I only wanted to know where I could find a place where I could get enough fresh fish to keep five hundred.

Adjourned.

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## August 6, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### THE PHILOSOPHY OF HAYMAKING.

Mr. E. A. Bower, Tompkins county, N. Y., desired the Club to discuss the subject of making hay. He inquired whether it is a good practice to salt hay, or to apply lime to it. He thought the Club should discuss the philosophy of making hay, and publish the discussions.

Mr. S. Edwards Todd responded as follows:

"Hay is dried grass. In the grass that will make one ton of hay there is usually, when the grass is mowed at the proper time, more than two tons of water, which must be got out of the leaves and stems before the hay can be safely stored in a stack or barn. The whole process of making hay consists in simply separating the water contained in the gum, sugar and starch in the stems and leaves of the grass. Making hay is nothing more nor less than saving herbs for botanical or medicinal purposes on a magnificent scale. Ask a botanical physician how to save valuable plants for medicinal purposes. His answer will be: 'Dry the stems and the leaves in the shade;' or evaporate the water in them. Ask old grandmother Grimes how to save catnip for her pussycat next winter, and she will tell you to dry out the water in the stems and leaves. Ask a farmer's boy who is as ignorant of the principles of natural philosophy as a Kamskatkan, why he toils, and tugs and sweats all day in the burning sun, tedding, turning, shaking and stirring the new-mown hay, and the guileless youth will tell you, 'to dry out the water, so that the hay will not heat and spoil in the mow.' Let the water be separated from the semi-fluid and semi-plastic starch, sugar and gum in the grass, and those substances may be stored in the hay-mow, where they will furnish about as much nutriment to domestic animals as if the grass had been consumed in its green state.

"When a ton of hay is half cured, there still remain barrels of water in a single load; and that water must come out, or the hay will be injured, or perhaps heated and spoiled. Many a load of hay is stored in the barn in which there is more than a barrel of water. Indeed, hay may be tolerably well cured, and yet three hundred pounds of water may be afterward dried out by a little exposure to the sun and wind. If stored in the mow, the heat that will be generated by this water will expel every particle of moisture before winter, to the great injury of the hay. And yet some wise (?) philosophers, who never made a pound of hay in all their lives, talk confidently of *absorbing* a barrel of water by the application of four quarts of salt, or a peck of quick-lime spread over the mow. And, only a few days ago, a chemist, claiming distinction, gave it as his opinion that he confidently believes 'the time is not far in the future when hay will be cured by an application of pulverized charcoal!' A farmer might, with the same propriety, mingle salt or lime, or pulverized charcoal, among half-cured or half-ripe cereal grain, after it has been threshed and stored in the bins."

Mr. Lawton.—In Westchester county the farmers put a little salt on their hay. I have always practiced salting hay to improve its flavor.

Mr. R. G. Pardee.—During the sixteen years of my farming, I never heard that the salt was put on hay for any other purpose than to induce cattle to eat it. My father was accustomed to sprinkle lime on his fodder to render it more edible. I have never before heard that salt was employed for preserving hay.

### KEEPING FARM ACCOUNTS.

Mr. S. Edwards Todd.—The success of a farmer will depend, in a great measure, on the manner of keeping his accounts. Merchants and men who are engaged in other occupations compute their successes and failures by their accounts. Farmers should do the same. Most farmers are too negligent about their accounts. They are seldom able to give an accurate statement of what they have done during the year. To aid young farmers in keeping accounts, two systems of keeping farm accounts were shown at the Club, and the merits of each explained. They are admirably adapted to the wants of common farmers. A farmer cannot do a better thing for a son, or for himself, than to spend ten or twenty minutes at the close of every day in recording cash accounts and suggestions relative to his farming operations. Both the books alluded to are very neatly gotten up, with ruled pages and with printed headings, so that each item may be recorded in its own proper place. Brigham's system is calculated for keeping a farm account for three successive years. Certain pages are appropriated to live stock, so that a farmer can see at a glance the value of all his domestic animals.

The Club fully indorsed the propriety of keeping an account of the products of the farm, and of entering everything relating to farming operations in the daily journal.

### REPORT OF COMMITTEE ON HAY LOADER.

The committee designated to report on the operation of Foust's hay loader, stated that they went to Elizabeth, New Jersey, where a working field model had been put in operation, and it affords them pleasure to say that the machine performed its assigned task with eminent satisfaction to all who saw it operate. They consider it a valuable labor-saving machine, as the team that draws the wagon, or cart, elevates the hay without any extra help, as fast as two men can load it. The most laborious part of making hay has been, hitherto, pitching it on the wagon by hand. But this hay loader will supply a great want in the line of farm implements for making and handling hay. Hitherto the chain of labor-saving implements has not been complete. The mower is followed by the tedder, which is succceeded by the horse rake, all performing their offices with efficiency and dispatch. After the hay had been pitched on the wagon by hand labor, the horse forks would remove it. But now, the line of valuable machinery for making and handling hay is so complete, that boys or light men, who are not able to pitch hay satisfactorily, can gather a load of hay in a few minutes.

### REPORT ON LENNOX'S POTATO DIGGER.

The working of a new potato digger was examined by a committee last fall, and highly commended as a thoroughgoing and successful machine. An opportunity was not then offered of seeing it work among heavy green vines. The committee reported that they were now able to say that such vines offered no impediment to its doing its work in a thorough manner, and the exhibition witnessed on Thursday, August 1, also enables them to say that this machine is as worthy of the confidence of the potato-growers as the mower or the reaper that of grain-growers. A description of this machine was given in the report of last October.

Mr. N. C. Meeker.—It should be stated that the machine dug only a row and a half. A trial of this kind should be continued till potatoes are dug by the acre. It should be added also that it was in a field where hired hands were digging from forty to fifty bushels a day with forks. Why it was not set to work in this place should have been explained, though it was hinted that the hands would have left if it worked. This is the only machine yet made. There are other potato-digging machines, and to do justice to the public there should be a trial this fall on a variety of ground, and by the acre, or ten acres; then it will give us an opportunity to compare the various machines.

### A NEW COOKING KETTLE.

Mr. Charles H. Burton exhibited an odorless kettle and cooking apparatus, invented by Mrs. S. E. Saul, No. 172 Henry street, N. Y. This is constructed with a tight cover, and has a pipe by which the steam and odor of victuals in cooking passes down into the stove, thus saving the air from being disagreeable and unhealthful.

Dr. J. C. V. Smith spoke highly of it, and several other members concurred. A committee of ladies was appointed to experiment and make a report. This is the second instance in which a lady has presented a patented article before the Club. Hitherto it has been remarked by thinking men that women never invent or take out a patent. A new day seems coming.

### SMALL FRUITS.

A. M. Purdy, South Bend, Ind.—I am watching with interest all that is said on the "small fruit" question. This season has proved favorable indeed for such. I should advise all who are setting small fruits, and who wish for a perfect succession for the longest length of time, to set the French, Wilson, Jucunda and Green Philipe strawberry. The first, very early and delicious; second, well known; third, called sometimes "Knox's 700," but proved to be the Jucunda, has astonished me this season with its fine crop, enormous fruit, and long season of bearing; the fourth, extremely hardy throughout the entire country, and highly productive.

Also set the Philadelphia, Doolittle, Miami Black Cap, Golden Cap, and Ohio Everbearing raspberry. The first enormously productive, and withstands our western winters without protection. The second, large, very productive, and the earliest black sort. The third still more productive than the last, and a stronger and still more stalky bush, and less thorny; fruit larger, less seed, and sweeter—in fact, far superior to the Doolittle in every respect—only that it is fully ten days later, and keeps in bearing two weeks after the Doolittles are gone, thus keeping up the raspberry season until blackberries are in full bearing.

The Golden Caps are fully equal to the Doolittle in bearing and size of fruit, and being of such beautiful color, present a magnificent sight on the table.

The last named (Ohio Everbearing) keeps on fruiting until frost comes. Add to these the old, well-tried Dorchester and New Rochelle, or Lawton blackberry; Red, Dutch and White Grape Currant; Houghton Seedling gooseberry; Concord, Hartford Prolific, and Isabella grape, and a good selection of hardy small fruits can be relied upon.

Mr. N. C. Meeker.—I know that Mr. Purdy has had large experience in raising small fruits; still one should not make too great dependence upon the Ohio Everbearing. On some soils, and in the hands of good cultivators, it is unsatisfactory. I have always found the Golden Cap a poor bearer, and the fruit woody. The Dorchester blackberry is not my favorite, nor is the Lawton, for it is too awful sour, and if you let it hang till ripe, it drops. The Wilson and Kittatinny are said to be better than either. The rest of the list is happily chosen. Still, let nobody plant largely till he is certain as to which will do best in his soil and climate. In a new place, one should experiment with leading sorts, before he can be sure as to which it will be safe to depend upon.

### TREE PROTECTOR.

Mr. D. McCaine, Groton, Mass., showed an arrangement for protecting fruit-trees from the ravages of the canker-worm. It is a mechanical contrivance, composed of wood and glass, and so constructed as to present an obstacle to the ascent of the worm. No tar nor coal oil nor other offensive material is required to stop the worms from ascending into the tree-tops. The protector is composed of a square octagonal frame of wood, made of strips one and a half by two inches, to encircle the body of the tree. The pieces are mitred at the corners. The frame is then suspended by a tent of cloth, securely tied around the body of the tree, so that the canker-worm cannot pass it unless it goes over the protector. On the under side of the frame, when it is suspended around the tree, there is a groove one inch deep, and about three-fourths of an inch wide. The sides of this groove are lined with glass, thus forming an angular groove of glass, on the under side of the protector, entirely around the body of the tree. It is contended that the canker-worm cannot get across this groove in the under side of the wood frame around the tree.

Dr. Isaac P. Trimble.—This would be of no use in New York, against the inch worm, the female of which has wings; but the female of the canker-worm cannot fly, therefore it will be useful where the canker-worm abounds.

The Chairman.—As the cost is eight cents a foot, or a dollar for a tree, the expense would be heavy. Mr. Quinn, how many pear trees have you?

Mr. P. T. Quinn.—From six to eight thousand.

### A NURSERY TREE-DIGGER.

Mr. W. Gilbert, Catskill, N. Y., showed a small model of a tree-digger for nurserymen. It is a kind of scoop plow, made of a heavy steel band, somewhat like the form of the letter U. The upper ends are bolted to plow beams, and one or two horses are hitched to each beam, and the implement is drawn through the ground beneath a row of trees, thus cutting off all the roots at a given distance from the stem of the trees. It is said to be a very useful implement for that purpose, and will save a vast amount of hard labor.

Mr. N. C. Meeker.—A similar contrivance is in use in the large commercial nursery at Bloomington, Illinois, digging trees by the thousand.

### A NEW CROSS-CUT SAW HANDLE.

Mr. Nelson Holmes, Laona, Chautauqua county, N. Y., exhibited a new cross-cut saw handle. Farmers who use cross-cut saws, often experience a serious inconvenience from having the handles riveted to the ends of the blades. To obviate this difficulty, an ingenious device was exhibited for securing the handles to the ends of the saw, by means of a set screw, by which a handle can be removed or attached to the blade in a few seconds, and they never work loose. Besides this, each handle makes a complete saw-set, for spreading the points of the saw-teeth. When a wedge is employed to keep the kerf open, so that the saw will run freely, one handle can be removed and the saw taken out of the kerf.

### EVERGREENS IN OSAGE ORANGE HEDGES.

A letter was read from Col. S. D. Harris, editor of *The Ohio Farmer*, Cleveland, Ohio, stating that it is bad teaching to recommend the above. No trees should be allowed to grow in or near an osage hedge, for the shade of trees is fatal to the growth of the plants. Even new plants will not grow to fill gaps in an old hedge.

### CLEAN WATER FOR COWS.

Mr. John Humphrey, Depeyster, St. Lawrence county, N. Y.—I keep a small dairy of cows, from twenty to thirty-seven, and every year there are more or less of them taken with a swelling in the bag. When they are most liable to this disorder, is when the puddles are full of stagnant water. When these are dried up, and they are compelled to go into the springs for water, they are not much troubled with it.

### MORALITY OF HOP-GROWING.

Mr. S. M. Ingalls, Springfield, Otsego county, N. Y.—A correspondent, in a late report of the Club, passes some strictures on the morality of hop-growing, alleging that the business tends indirectly to the spread of intemperance. I am, and have been for several years, a producer of this important staple, and must confess that any question as to its improper tendencies never occurred to my mind. I believe that the use of fermented and distilled liquors is a preventive of drunkenness, by supplying the place of alcoholic stimulants. Facts sustain this view. The German population are extensive consumers of beer, using it as an article of diet daily. They are temperate not only, but healthy. The lower classes in England are large consumers of the different varieties of ale, and intemperance is by no means common among them. Malt liquors are sedative, and tonic in their effects, and hence beneficial, especially to persons of weak or irritable nerves. Your correspondent might with better propriety have found an argument against growing wheat or rye, upon the fact that these cereals are manufactured into whiskey, the drunkard's favorite beverage. Hop-growing is a preventive of intemperance, and not accessory to it.

### KINGBIRDS EATING BEES.

The Secretary had detected kingbirds in eating his honey bees in Brooklyn; two of them had been shot by a neighbor, and he had brought them to the Club for examination, where they were dissected, and bees found in their crops.

Mr. John Crane.—I examined this matter long ago, and found that the kingbird eats nothing but the drones.

Dr. Isaac Trimble examined them with a glass, and pronounced them to be drones, and not a worker among them. He spoke of the wickedness of killing such birds.

### ORCHIDS OR AIR PLANTS.

Dr. H. G. Lungren, Volusia, Florida.—I take the liberty of sending you a few specimens of one of our greatest curiosities—the Florida air plant. I think you will agree with me in saying they are quite unique. The plant is considered a great curiosity with us. How much more so will it prove to you? The plants I send you are very small, being young plants. When old, they are often five or six feet in height. I will try and give you some of its peculiarities, but cannot give the botanical name, for all works on Southern botany that I have, fail to describe it. This plant grows freely in all situations—adhering to the bark of the oak, cypress, cedar and maple. It is occasionally, but rarely, found growing on the pine. But its most favored locality is on those large magnificent live oaks which overhang our glorious river—the St. John. Unlike the misletoe, it does not penetrate the bark and woody fiber, but ramifies its sparse roots into the cracks, inequalities and crevices of the bark. These roots seem merely for support, not for nourishment. It may be truly said to be an air plant, as it derives no nourishment from the bark, but wholly and solely from the air and moisture of the atmosphere. When you pluck it from the tree, no matter where you throw it (provided it is on woody matter), the plant will live. You cannot easily kill it, except you bruise the stem. It seems to live as well without as with water, though from their abundance on the banks of our river, it would seem as though that was a favored locality. This plant is one of the kindest friends to the hunter and the traveler; for no matter where found, whether on the stunted live oak in our burning, almost endless sandy, barren scrubs, where no water can be found for ten or twelve miles, or by the river bank, wherever found, if you pluck it from the tree, and invert the stem over a tin cup, you will obtain from each plant from two to three ounces of the finest, purest cold water that it ever was the fortune of a thirsty traveler to partake of. Where this water is obtained I cannot imagine, unless from the heavy dews we have at night. You can well imagine the joy and pleasure evinced by the wearied hunter, as he descries in the distance a lonely live oak, after a day of tiresome hunting in our hot, burning, sandy country; say, for instance, on a July or August day; for well he knows that from the air plants on that live oak, he will obtain an abundance of fresh, pure, water, cold as ice-water, almost—while even the plant is exposed to the burning sun.

If you will tie the plants by the root to any rough-barked oak, and occasionally for a few weeks syringe them twice a week or more with water, you will find in a little while they will adhere to the bark, not as the misletoe does, by entering the wood and deriving its nourishment from the sap, but simply for support. With a little care it will live. Remove it on approach of cold weather to your sitting room, not, however, too near the fire. This you can readily do by tying it to a billet of rough barked firewood, for this plant grows as well on dead timber as live wood.

If any member of your Club, or readers of your proceedings, should wish specimens of these plants, I will send them by mail, two of each of the six varieties, if in return they will send me garden and flower seeds, or strawberry plants in a quantity for distribution among the destitute whites and blacks who cannot readily obtain garden seeds. Let them send me a good-sized package of seeds, and I will send a good package of air plants, and post paid.

Adjourned.

## August 13, 1867.

Mr. Nathan C. Ely, in the chair. Mr. John W. Chambers, Secretary.

### PLANTING DWARF PEAR TREES.

Mr. Wm. A. Ellsworth, Salem, N. J., inquired as to the best time for planting dwarf pears, the variety most esteemed, and the time at which standard pears come into bearing.

Mr. John Crane.—Of late years, the fall season is the best, and we seem to have no spring months suitable for planting. I have often known the month of March more favorable for planting than April was this year. There is another thing—one can always buy the best trees in the fall. In fall planting, the trees need to be set some deeper than in spring planting; at least, there should be mounds of earth around the trees.

Mr. Thomas Cavanach.—Fruit-growers disagree on this subject more than on any other. In my experience I have lost many more trees by fall than by spring planting. If trees are bought in the fall, they should be heeled in deeply, not slightly, as is the practice with many; for, by so doing, many trees freeze and are lost. Last spring we planted several hundred dwarf pears, about the 30th of May, and every one of them is alive.

Mr. Wm. P. Peck.—Thousands have asked me when to plant trees, but they neglect the much more important inquiry as to how they shall plant them. If a tree is well planted and cared for, the season will make little difference.

Mr. Wm. Lawton.—Much allowance should be made for the kind of trees, and in particular as to whether the roots are fibrous or otherwise. Pears on the Angiers quince have fibrous roots, and they easily live. I am decidedly of the opinion the spring planting is best.

Mr. John M. Crowell.—In New Jersey the soil is so favorable that there will be no difficulty in planting in the spring.

As regards the best pear, the Chair and most of the other members were in favor of naming the Bartlett.

Mr. Peck said that, for the climate of Albany, where it will come late and can be kept, it is the best; but on the warm Jersey lands it comes early, and often must be sold cheap.

Mr. Evlin said the other kind are uncertain on Jersey soil, and they are cultivating the Bartlett almost exclusively.

The Chairman said he had a standard Bartlett in bearing four years old.

### STRAWBERRIES AND GRAPES AT PITTSBURG.

Gen. J. S. Nagley stated that the strawberry crop this year, at Pittsburg was the finest they had ever grown. While the market of New York was glutted, their fruit, brought hither, sold at sixty cents a quart. Grapes are doing uncommonly well, and little fault was found even with such varieties as the Iona, Delaware, and Catawba. Although Pittsburg is a favorable locality for fruit, it is no better than through a vast extent of that State. The secret of their great success has been ascribed to the soil, and to the coal smoke, but this is not so; it is in having vigorous vines and plants, and a thorough knowledge of the business. The General then extended an invitation to the Club to visit the vineyards in September, which was accepted by Dr. Trimble and some others.

Mr. J. R. Sypher.—I have visited Mr. Knox's grounds, and have been made acquainted, in part, with the method of cultivation. If a full description of the course pursued could be imparted to this Club, great progress would be made in the cultivation of fruit.

### OVERTAXING SOILS.

Dr. J. E. Snodgrass read an interesting paper on this subject, suggested by a visit to Vineland, with which place he appeared much pleased. He warned cultivators against the practice, too common on small pieces of ground, of taxing the soil with the production of a great variety of fruit, and beyond its capacity.

### THE KITTATINNY BLACKBERRY.

Those members who last week visited the grounds of this fruit in Newton, Sussex county, reported on what they saw. Mr. E. Williams, of Mont Clair, N. J., who owns the original plants, planned this excursion and carried it out successfully. Passes were furnished the Club on the railroad; and at Newton an excellent dinner was provided at the Anderson House, when they visited the blackberry field and saw handsome bushes, fairly loaded with the fruit. While, perhaps, it does not bear more abundantly than the Lawton, it is decidedly its superior in good qualities. As it originated in the Kittatinny mountain it is hardy, and there is little doubt that it is the best cultivated blackberry known.

After returning to the town, a meeting was organized, and Gen-Halstead was selected chairman.

Dr. Isaac P. Trimble, being called out, spoke of the advantages of New Jersey for fruit-growing, as witnessed on this occasion, and he estimated the soil for this purpose as worth more by twenty dollars an acre than the soil of any other State.

The Chairman spoke of the adaptation of the light soil of South Jersey for farming purposes, and he maintained that forty-five bushels of wheat to the acre had been raised there, in one locality, this season.

Dr. J. C. V. Smith was enthusiastic in praise of that section of New Jersey, and with the impression that all the land they had passed through could be made more profitable than a corn-field by the cultivation of the small fruits.

Mr. Thomas Cavanach said that, after what he had seen of the Kittatinny, he would take back what he had said before, and he acknowledged it superior to the Lawton.

Mr. J. J. Thomas said that he had brought this variety safely through the past winter, which was one of the severest, on such plants, he had ever known, while the Lawton had been cut down severely; and from two-year old plants he had, perhaps, four hundred full-sized berries. More time was required thoroughly to test the Kittatinny, but at present it is exceedingly promising.

Mr. P. T. Quinn said he felt proud to be associated with men who had introduced a fruit of such value, and during four years he had not changed his opinion of it.

Mr. William Lawton, the originator of the Lawton, gave the Kittatinny great praise, and spoke of the advantages all new fruits are to a country, by giving employment and food to a greater number of persons.

Mr. L. Witherell, of Boston, spoke of the new aspect of horticultural discussions, which lately includes the presence of ladies.

Mr. S. R. Wells made a happy speech on the connection which exists between the development of the higher faculties of the mind and the growing of fruit, the adornment of homes, and the superior advantages which the laboring men possess as a result of such efforts.

### SCARCITY OF TIMBER.

Mr. Oscar Runnels, Hamilton, Madison county, N. Y., speaks of the scarcity of timber, and thinks the locust could be raised, as it grows rapidly; but he does not know how to start such a grove.

Mr. N. C. Meeker.—In various parts of the country the locust has not proved satisfactory, on account of the attacks of borers, and it sprouts badly. Perhaps there is no tree more profitable to grow than the chestnut. The ground should be well prepared, and laid off in rows, like corn ground, in the fall, and the nuts placed either where the trees are to grow, or in a moist place during the winter, and be planted in the spring. They should be gathered green, and not be permitted to get dry. The nursery should have clean cultivation. Where the soil is good, black walnuts make a rapid growth. Twenty-five years ago Capt. Brown, of Berlin, Sangamon county, Ill., ran two or three furrows around his farm, and dropped in black walnuts. They grew, and had cultivation and care, and now there are rows of magnificent trees, several miles long. Some of these trees are more than a foot in diameter.

### SHOEING HORSES ON THE PRAIRIE.

Mr. W. W. Beebe, Dubuque Nursery, Dubuque, Iowa, writes: I drive and work a span of 1,000-pound horses, who have not had shoes on their feet for five years, and never on their hind feet, and I always regretted the mistake of putting shoes on their fore feet, even in one winter. I avoid all heavy hauling while ice prevails, but drive them even up and down hills, and as fast as the best of shod horses. They were made lame by shoeing, but never since, and their hoofs are almost as hard as iron itself. So, I say, keep shoes off colts as long as possible. If their feet become tender, let nature have a little time to increase her power of resistance, then go on again. It is amazing to all inveterate horse shoers to see what substantial work nature will do for the feet of our horses, if we only give permission. Against the practice of early, constant, and indiscriminate shoeing, I urge the following considerations, viz: The time, travel, and cost; the breaking of a hoof—by shoeing and becoming tender—if a shoe comes off unawares, or at a distance from a blacksmith; the liability to distressing limpings and constant lameness from interfering corks; the habitual corking of themselves, causing long times of lameness, and often split hoof for life; the serious consequences that attend the kicking of sharp shod horses; the putting of iron weights upon those extremities that

God intended to be as light as possible. My young span, "Lightfoot" and "Fleetwing," who easily go three and a half miles, to the post-office and return, in from forty to sixty minutes, are not likely very soon to exchange the elastic step of the light-shod Yankee for the dead tramp of the English peasant, whose double soled, iron spiked, or plaited clogs are well nigh inhuman. I have known very heavy horses, unshod when young, attain an elastic, light step, that lasted all their lives, even though shod at a later period.

"But, do your horses never fall upon the ice?"

I answer yes, about as often as the shod ones, and with this difference: They have thereby damaged themselves with their ever dangerous corks, while mine are unharmed, and soon learn better than to fall, if ever so icy. I speak not of heavy, draft horses on macadamized streets and levees, or of roadsters in a rock bound country, but of prairie farm horses. and thousands of others, too, which are so very needlessly shod. I say, begin right with the next colt, and keep the horse-shoeing shop off the farm. While talking about horses, I want to condemn most decidedly the barbarous practice of binding down upon the brain or forehead under heavy bridle bands that foretop that God evidently designed should fly loose in the breezes. Oh! cut those bands off your bridles, or else pull out those foretops, especially in hot weather, and your horses would thank you a thousand times if they could only speak.

### REPORT ON MRS. SAUL'S POTS AND KETTLES.

The committee of ladies designated to report on the pots and kettles invented by Mrs. Saul, which have a flue for conveying steam and offensive odors into the fire, reported as follows:

"That these domestic utensils for culinary purposes are most excellent devices for securing the objects for which they are intended. Every ambitious housekeeper who desires to have all disagreeable odors which must always arise from certain kinds of food when it is being cooked, conveyed to the chimney instead of being carried to every room in the house, will readily appreciate spiders, pots and kettles that will always keep the air pure and sweet throughout the entire dwelling house."

Mr. N. C. Meeker.—Where poor people have to do all their cooking in the room they live in, this cooking utensil will be hailed with delight.

### SOWING PLASTER.

Mr. T. Dewey, Richland, Kalamazoo county, Mich.—I have cultivated an extensive farm several years, and have found the best way to sow plaster is to wet it before sowing. I always sprinkle about a pailful of water on 300 pounds of plaster, and mix it thoroughly. There are several advantages in doing this. First, when sowing there is no dust; it is no more disagreeable to handle than wheat. Second, it falls just where it is intended to. Third, it can be sowed at any time. Four years since, I took a farm which had been worked by a man eight years. His average wheat crop was eight bushels per acre. The first year he did little except to follow me around when I was plowing, and tell me that I would raise nothing—"he had taken all the cream out of the land." The first year I raised twenty-six bushels of wheat per acre from the same land.

### CLUB-FOOT CABBAGE.

Mr. Abraham Herr, Reading, Pa., wishes a remedy for a wart or hard green substance growing at the bottom of the roots of his cabbages. This disease has become so prevalent that his neighbors planted few cabbages this year.

Mr. N. C. Meeker.—This and other diseases of cabbages are common through the country, and no one pretends to cure them. Perhaps there is no vegetable more difficult to grow, nor is there one, when it is grown, which the cows are so likely to get after. Around New York, the professed gardeners have little or no difficulty; at least, if they succeed at all, their success is complete. The general rule is, to grow cabbage on ground not recently devoted to them. We have seen a piece of heavy grass cut one day, the ground plowed the next, and cabbage planted on it the day after. Sod is preferred. Very little care seems to be given in planting, at least the work is done with great rapidity, a hot sun comes out, every plant seems dead, but in a day or so they are all alive, and it is not uncommon to find acres where not more than one plant in a hundred is dead.

Mr. P. T. Quinn.—Never apply hog manure to land on which you plant cabbage. Adjourned.

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## August 20, 1867.

Mr. Nathan C. Ely in the chair; John W. Chambers, Secretary

### A FINE CLUSTER OF PEARS.

The Chairman exhibited a branch of a young pear tree, bearing ten perfect pears of fair and full size, all of which touch each other, and the cluster weighs over two and a half pounds. Surely the sandy barrens of New Jersey are redeeming their reputation for the production of fine fruit.

Mr. Wm. S. Carpenter.—I recognize this pear as the Belle Lucrative, one of our choicest varieties; and these are fine specimens.

Mr. S. Edwards Todd.—We have here a most beautiful and instructive illustration of what may be done on soil no better than it is in despised New Jersey, by way of producing fine pears. I saw this cluster of fruit last week growing on its parent stem, only two years old. Had this tree been mine, I would have stripped off all but one, as soon as the young fruit had commenced to grow, as the growth of the tree would have been of more value than the pears while the tree is so young.

Mr. H. P. Smith, Westfield, Mass.—I am truly surprised at the admiration expressed by this Club at this cluster of pears. I expected to see the pomologists in this Club express their unqualified disapprobation of allowing a young tree to grow itself to death in this manner. I consider it disgraceful to any man to present such a cluster of fruit from a tree so young. If I had a gardener who would present me with such a large cluster of fruit on a tree only two years old, I would tell him to go, as he is not the gardener for me. My man said to me one day: "That is a splendid and noble horse of yours. He hauled to-day 5,800 pounds at one load from the freight-house." I replied to him: "Discharge that driver at once." So I would do with a man who would abuse a young tree like that.

The Chairman.—I do not feel like censuring those gentlemen. What they have done furnishes an illustrious example of what good cultivation will do on such soils as we find in that part of New Jersey. This simple fact, that so many pears can be produced on one tree, the second season after the tree is grafted, may stimulate other men to grow fruit who have always thought that

"He who plants pears,
Plants for his heirs."

A man is not always culpable for such an act, when great good is likely to result from the experiment. It is worth the price of one tree to know what can be done in two seasons with a young pear tree.

### CLOVER ON LIGHT SOILS.

Mr. S. Edwards Todd.—With your permission, I will talk my one minute about the vast importance of raising and turning under more red clover on light soils. Red clover is good on our heavy, calcareous soils, such as I used to work in Tompkins county, of this State, where the "hardpan" comes up to the second rail of the fence; and it is good also on the lightest kind of sandy loams.

While ruralizing in New Jersey, I met with about nine acres of as heavy a corn at Bricksburgh as I ever saw; and it was growing on a light soil, where a clover sod had been turned under last spring, with only a thin dressing of barnyard manure. I never saw better corn before on any of the heavy soils of New York. And at Tom's River, last week, on the farm of Messrs. Gowdy, I saw a very large field of corn, which looks more like a young forest than a crop of grain. This corn was also planted on a clover sod. The crop equals anything I ever saw in the line of Indian corn. Almost every stalk has two ears on it, and many of them three ears; and a large proportion of the stalks are eleven and twelve feet in height. There is nothing like red clover for transforming these sandy and loamy soils, and even heavy soils, into a fertile mould by the application of a little marl and a sprinkling of muck. Our fathers told us to shun the sandy soils. My father always told me to keep away from the light soils. But when I came to see how easily the light soils of South Jersey can be cultivated, and what wheat and corn can be produced on sandy loam, that looks more like dirty snow than a cultivable field, I say give me a sandy loam, and you may have the clay. I was brought up amid bitter prejudices against New Jersey, because the soil was said to be so light there. But I must confess that I have never seen so heavy corn, nor better wheat than I met with on Messrs. Gowdy's farm. The great trouble is, not in the soil, but in the system of farm management. The soil will be all right if it be managed properly.

### HOW TO GET A START.

Dr. Isaac P. Trimble.—I have been exceedingly interested in the remarks just made; but as it is always considered a difficult matter to get clover started, I would like to have Mr. Todd tell how to do it.

Mr. S. Edwards Todd.—It is a very easy thing to produce a heavy burden of clover when there is not a trace of vegetation. Why, I tell those "Pine Jersey men" who think they can't raise anything on their light soils, that if I were banished to the most sandy, repulsive and barren "Sahara desert" that they can find in that State, I would soon bring it into such a state of fertility that the ground would produce just as fine pears and apples as these here before us, and just as large potatoes as these, and red clover as heavy as any man desires to see. I have my mind on a spot in Manchester, where the ground last year looked more like dirty snow than soil. But this season I have seen two crops of red clover mowed on it, and removed; and now the third crop is up so that there is a good bite of grass. In this instance, nothing but a dressing of muck was applied to the soil. Surely, "muck is the mother of meal."

Now, then, to get a start of clover, I would spread a dressing of muck and a little marl over the surface this fall, or at any period in the winter, and harrow it in most thoroughly. Early in the spring, before the growing season commences, I would sow about five hundred pounds of Bough's raw-bone superphosphate of lime per acre, and harrow that in. Then sow the clover seed and bush that in. If I desired to make pasture or a lawn, I would sow and bush in at the same time, a bushel of Kentucky blue grass seed and four quarts of timothy seed per acre. Such soils need phosphatic and some nitrogenous material for making grass and clover grow. Last year, when I came in possession of my Brooklyn City farm, the proprietor had been trying, for seven successive years, to get grass on the front lawn and in the back yard. I felt ashamed of it all last summer; but go there to-day, and you will find a perfect mat of green grass—a most beautiful green carpet—on those barren spots, which have been mowed twice the present season; and I observed this morning that the grass in my rear yard has become such a dense mass that it is now rotting down. To produce this luxuriant growth, I simply fed the soil what there was lacking to produce a crop of beautiful grass. Simply a dressing of Bough's raw-bone was applied, which will soon change any barren waste into a beautiful green lawn. It is a great point gained to know what the land wants.

Mr. N. C. Meeker.—I can tell how such bountiful crops of Indian corn and wheat and clover are produced. We generally find such large crops near glass works, or other extensive manufactories, where a large number of teams are kept. Of course, a large quantity of manure is made, and it is carted, at an enormous expense, to those fields. Any one can produce such crops with a bountiful supply of manure.

Mr. W. P. Peck.—I would prefer a farm of sand to a farm that is more like a stone-quarry than a cultivable field. I know of farms in Westchester county, where I reside, where the proprietors have been obliged to spend more than one hundred dollars per acre to remove the stones, and then they did not get them all out. After this they were obliged to ditch the land, incurring another expensive outlay. This might do if they were not required to manure the land after removing the stones and draining it. But the soil wants as much manure there as in New Jersey, where, with the same cultivation, the light soils will produce the heaviest crops in the shortest time, and with less hard work.

Mr. F. E. Bradshaw.—I saw large fields of heavy clover at Winslow, that would yield three tons of good hay per acre, on light sandy loam-soil, which proves conclusively that red clover will grow satisfactorily on light soils.

Mr. S. B. Nichols.—At Hammonton, we never experience any difficulty in securing a good catch of red clover, by simply applying a dressing of marl to the soil.

Dr. Trimble.—I have been, the past week, to the "jumping-off place" in New Jersey, and I was surprised to see the immense crops of clover that are grown there with marl. We can see the marl among the growing clover on the surface of the land.

Dr. J. E. Snodgrass.—I can testify to the truthfulness of what has been said here about marl and red clover. Clover is a wonderful fertilizer. Down on the old worn-out land of Maryland and Virginia, a dressing of marl and a sprinkling of the raw-bone fertilizer or guano will always produce a bountiful crop of clover; and if farmers can grow heavy clover, they are prepared to raise other crops. The great secret of the successful agriculture among Pennsylvania farmers at the present time, is their clover crop. Take away their red clover and you disconcert all their plans for future operations. Show me good clover, and I will show you good farming.

### KANSAS GRASSHOPPER.

Mr. Shaw, Chicago, Ill., showed a Kansas grasshopper, preserved in alcohol. He stated that these insects exist there in untold numbers. This one, he said, is a young one. But even this one was very large, and much longer and thicker than any grasshoppers that are seen in this part of the country.

### REMEDY FOR THE STRIPED BUG.

Mr. E. D. Wood, South Butler, N. Y., informs the Club that he has discovered a certain and never-failing remedy for the striped bug, which infests vines in the kitchen garden. It is simply this: Smear a lot of stones, or old pieces of cloth, with coal tar, and place them near the growing plants. The offensive odor emitted from the tar will repel the bugs most effectually from the growing plants. This is easily tested, but we doubt the efficacy of tar for this purpose. Adjourned.

## August 27, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### FARMING BY WOMEN.

Mrs. Mary Baker, Gorham, Fulton county, Iowa, writes to the Club, that, besides doing general housework, she cultivated an acre wholly herself, having put a part in strawberries and other small fruits, and the rest in beans, vines, and other crops, and now there is not a weed to be seen. The summer has been very pleasant to her.

### SPONGE FOR BEDS.

Mr. Wm. P. Peck exhibited a quantity of sponge, prepared by a new process, which will supersede feathers. Being entirely destitute of animal matter, which is so objectionable in feathers, it will neither breed nor retain insects; it is elastic and comfortable, and is sold at the price of feathers.

Dr. J. C. V. Smith.—Sponge may make a good bed. I neither deny or affirm, for I have no knowledge of the subject, but nothing is more certain than that sponge is an animal. Every hole is a mouth through which food was introduced, and the sponge is only the skeleton of the animal.

Mr. Solon Robinson.—Feathers will always sell, for there are always fools who will buy them. I am in favor of recommending geese for profit, though I will not sleep on feathers.

Dr. J. E. Snodgrass.—Sponge contains a considerable quantity of iodine, and will be likely to have a medicinal effect.

Dr. Lewis Feuchtwanger.—Permit me to remark, gentlemen, that sponge is neither a vegetable nor an animal—it is a zoophyte; that is, an organism exhibiting characteristics of both.

### GEESE.

Mr. James R. Wheeler, Queens county, L. I., makes an inquiry as to the profit of raising geese.

Mr. Solon Robinson.—Geese are as profitable as young cattle.

Mr. N. C. Meeker.—The person with whom I am in company, wanted to keep geese for several years, but at last, when we set up in Southern Illinois, she got some, notwithstanding constant opposition; and in the course of time she overcame all scruples. The minks and foxes took heavy toll, but she kept up a stock ranging from ten to fifteen, for several years, and obtained a large quantity of feathers, beside down enough for several comforters. If one has an acre or so of wet ground, particularly if a part contains water, it can be very profitably devoted to geese. When one lives on the shores of rivers or lakes, or in remote settlements, where there is range and cattle-run in the road, one can keep geese well. A great many are kept by Germans in the neighborhood of all cities. Sometimes we get very wise. When we talk against feather beds, we forget that we must have pillows. Why feathers are unhealthy for the body, and yet good for the head, one would like to be informed. Persons in low health, and children, should have feather beds in winter, and in sharp cold nights they will hurt nobody. Every lady, traveling twenty-four hours in the cars, needs a pillow; and a pillow is often in request behind the back in a rocking-chair. We have seen things carried on a pillow. If we do away with feathers, the sense of that beautiful line, speaking of "downy pillows," will be lost. Of course, I refer to fresh feathers; not to those which have been used by families living through many generations; for nothing is more repulsive.

Mrs. H. N. Wood, Cayuga county, N. Y.—No animal has been so relentlessly persecuted, oppressed and abused as the poor goose, and all for trying to exercise the right to life, liberty, and the pursuit of happiness. Let the farmer turn out any other animal, unprovided and uncared for, and see if it would do any less damage or be any less troublesome. As yet, no substance has been discovered or invented, that is equal to good, ripe live feathers for a bed. They are light and airy, and, when properly cared for, do not retain and emit unpleasant odors, like matresses, while they last longer than anything else. No one who has slept in a good feather bed, when the thermometer was below zero, saying nothing of downy pillows, or down comforters, would wish for anything better. I would not have that man for a husband, who would not consent to sleep upon feathers in winter. He ought to have a Dutch woman, who would place the feather bed over, instead of under him. Of course, no sensible person would think of sleeping on feathers in summer, any sooner than they would wear thick overcoats and furs during the dog days.

### BUTTER-MAKING.

Mr. S. Edwards Todd.—Butter is not that ring-streaked, speckled, spotted and grizzled material that is transported to the New York butter markets in vessels that resemble an elegant swill pail more than a neat butter-tub, but it consists of the fragrance of green grass, the aroma of the mellifluous clover fields, the exquisite nectar of new-mown hay, collected in glowing globules, like sparkling dew drops on the petals of May roses, by fairy hands that are never soiled by dirt and offensive odors; and the delicious essence is impailed in an atmosphere as sweet and pure as ether, and wrapped in a napkin as clear as the unsullied snow-drift. Dirt, foul odors, infected air, pestilential earth and butter are pefect antagonisms. Soap grease, shoe grease, wagon-wheel grease, which we see in such vast quantities in the markets in butter-firkins, approximate about as nearly to butter as old Mother Countryman's pie-crust shortening, which was extracted from the suet of skunks. This is the negative and affirmative of butter. Now, then, the next consideration is what to do, and what not to do, to make delicious butter. Negatively, do not allow Pat, nor Dick, nor any one else, to do the milking after grooming the horses, dusting the piggery, or kneading the compost heap, without first giving his hands a thorough ablution in soap suds. Then set the milk in an apartment as neat and sweet as a bee-hive; and, if possible, let the cooling breezes from the green hills pass in one window, over the milk, and out at another window. As soon as a thick cream has risen, remove it, with as little milk as practicable; and the sooner the cream is churned the better the butter will be. Never allow the cream to rise in temperature above sixty-four degrees Fahrenheit. If it can be kept at sixty degrees, the butter will be all the better for it. After churning, instead of throwing the golden-colored globules into a dirty wash-tub with the fire shovel, and allowing Bridget to mount on it with her pattering trotters to tread out the buttermilk as a donkey tempers clay at a brick-kiln, remove the butter with a clean ladle into a clean butter-tray or worker, never touching it with the bare hands. Then, with the sharp edge of the ladle, make deep gashes all through the butter, and the buttermilk will flow into the gashes thus made; and when the gorge is thus closed, the liquid will flow away. After buttermilk has once been liberated by gashing the butter, it is not practicable to confine either water or buttermilk again in the butter. Neatness and the proper temperature are fundamental requisites in making a choice quality of butter.

### SUNFLOWERS.

Dr. J. C. V. Smith.—When I was in Egypt, I noticed something very peculiar in the soil; and afterward, in conversation with Baron Humboldt, in Berlin, he told me that the fertility of that country is owing to a slime, the product of fish. But I rose to speak more particularly on the value of the sunflower. If I were a farmer I should plant it. When De Soto discovered the Mississippi he found that there were a civilized people in what is now Tennessee, who were governed by a queen, who sat on a throne. Nor were the people at all like the aborigines. Among the great variety of beautiful crops which they raised, he noticed the sunflower had great prominence, the product of which was used for butter, lard, dressing leather, and for lamps, having the same qualities as olive oil. A quarter of an acre would make a prodigious yield. It is preferred by poultry to corn, as it is in some degree animalized, and it can be made into cake suitable for feeding horses and cattle.

Mr. Alfred Spear.—When I was farming in the West, we all had the sunflower fever, and huge quantities were raised; but there were two difficulties, one was to get the seeds from the hulls, and the other to find any market for the seed after we got it out. We fed it to our poultry, and in this way found it very useful, for they decidedly preferred it to corn.

### TEXAS GRASS.

Mr. J. L. Hughes, Austin, Texas, sends some specimens of this grass to the Club. It is a long, coarse grass, resembling dwarf sorghum. It grows luxuriantly first during the summer, and in the latter part of winter. The summer or bottom grass makes hay superior to Northern timothy; cattle eat it up clean, and the cavalry officers prefer it in making contracts. Here it is called Fescue. I intend to send seed to friends in Mississippi, to have it tried there, and if you have friends in the Southern States who would like to make a trial, I will assist them in getting seeds if they will write to me. I want to see the farmers flourish, and have good grasses which furnish good milk and butter.

Mr. Wm. S. Carpenter.—This Club is much obliged to this gentleman for sending us this specimen of grass. It may not flourish so far North, but I would like to try it; and we are always pleased when others send us what they may think would become important additions if generally disseminated. I have become convinced that the subject of the grasses is of very great importance, and our farmers should be willing to get out of old tracks so as to experiment with new varieties, in order that some kinds may be found, if possible, superior to timothy and clover.

### DEATH OF MR. FRANCIS C. TREADWELL.

The Chairman spoke of the death of Mr. Francis C. Treadwell, an old member of the Institute, who several months ago made such strenuous efforts to have a flour inspector appointed, that people who want good flour might know they were getting it. Through the influence brought to bear by the millers and dealers, for no other parties opposed it, the plan was defeated in the Legislature. Dr. Snodgrass then offered the following:

"*Resolved*, That this Club has heard with profound regret of the death of their venerable associate, Francis C. Treadwell, sr., who was a man of singular earnestness in all the affairs of life, and of great usefulness in the reformatory movements of his time.

"*Resolved*, That we can but sensibly realize the vacancy made by his absence, and that we hereby express our sincerest condolence with his venerable relict, and the other surviving members of his family, in view of their irreparable loss."

Which were unanimously adopted.

### GAS TAR PAVEMENT.

Mr. Wm. P. Townsend, Westchester, Pa.—This is easily made, and after a year's experience I can recommend it. Mine was put down after the following manner: A bed of coal ashes and sand was made, three to four inches deep, raked off smooth, and graded a half inch to the foot from fence to curb. The tar, just as it comes from the works, was drawn from the barrel into an ordinary Yankee bucket, from which it was dipped with a tin cup, and poured on about a half inch thick. Over this was thrown, lightly, about a half inch of good, sharp sand (unriddled). This was settled, lightly, into the tar, by a wooden stamp, twenty by sixteen inches, with an upright handle. A board, sufficiently wide to stand on, was laid on, and about three feet were laid on at each time, until the whole was completed. It is six feet wide, and about 175 long, requiring in its construction five or six loads of good, sharp sand, and about 160 gallons of tar, or four barrels, which costs here two dollars per barrel at the works. The pavement is preferable in many respects to brick. It does not become green and slimy, but is hard, compact, and sheds the snow more readily in the winter. It requires warm, dry weather in which to lay it down, and it should be well pounded every twenty-four hours for three or four days, or until it is firmly settled. The whole process is very similar to laying a mortar floor in a cellar, and requires about the same attention. I am now just about laying tar pavements through the yard and garden, and expect to get shut of grass and weeds in them, and have hard, dry walks at all seasons. Adjourned.

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## September 3, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### REPORT ON DODGE'S CEMENT.

Your committee, to whom was referred the cement for leather, cloth, &c., invented by Theodore A. Dodge, have tested its adhesive power, and beg leave to report their experiments, with the results:

Having procured a strong strap of such leather as is used for rough bridles, they saw it fairly cemented by Mr. Dodge, with the aid of heat, this having been cut, and the opposite surfaces, previously skivered, for about an inch and a half on each end, and brought in contact with the cement between them. They then, after soaking the splice for two days, attached either end of the strap, so spliced, to the tail of a furniture cart, and started the horses in opposite directions. The result was the tearing of the skivered sides through the middle, but leaving the respective ends of the same unloosened.

Some experiments, instituted by an experienced shoemaker, under their direction, have satisfied your committee, that for patching boots and shoes, this cement would be found quite reliable and useful.

Upon the whole, your committee are prepared to report this cement as promising, so far as they have been able to test it, to fulfill all that its inventor claims for it, not only in wagon gearings, but beltings, such as are used in massive machinery, and they feel warranted in commending it accordingly to those concerned.

Respectfully submitted.

J. E. SNODGRASS,
S. EDWARDS TODD, } *Committee.*

### WORMS IN CODFISH.

T. S. Hubbard, Fredonia, N. Y., sent a specimen of worms taken from the flesh of a salt codfish. They were found in all parts of the fish, and must have been there when the fish was alive. The fish was in an excellent state of preservation, but the worms were alive, and some of them, when extended, measured two inches in length.

### A NEW FRUIT PEST.

Dr. Isaac P. Trimble exhibited a pear which was infested with an insect recently discovered. Entomologists have not described it in any of their scientific treatises on insects. This one originated in Connecticut, and has been gradually working to the westward. This specimen was a two-winged fly, similar to a common house fly, having wings of a beautifully variegated color. The doctor stated that he put some of these maggots into the ground last season, where they remained in a normal condition until the past June, when they came out flies.

### AROMA CONDENSERS.

Mr. Nicholas Hotz, Greenpoint, L. I., exhibited several of his aroma condensers, a new style of coffeepot or teapot. The object is to save the aroma of the coffee, which is usually driven off by evaporation, and lost. The committee made the following report: "The 'Aroma Condenser' consists of two vessels, one of which is similar to an ordinary coffeepot, into which the coffee is deposited, and boiling hot water added. The vessel is then placed on the fire, with another vessel or cup, having a hollow worm made of tin, coiled within it. This small vessel is placed on the top of the coffeepot, and filled with cold water. When the coffee boils, the steam and aroma enter the hollow worm, and before they arrive at the upper end of the worm, the cold water will condense them and return the liquor to the coffeepot. By this simple means, the most delicious part of the coffee and tea, which is usually sent up stairs into the parlor or bedchamber, long before meals are ready, will be saved and served up at the table." The committee, to which it was referred, spoke of the device as an excellent invention.

### VINEGAR FROM THE POMACE OF APPLES.

Mr. Amos Steller, Cary, Ohio.—Do not allow your sweet apple pomace to go to waste after the sweet cider is expressed, but put them in some water-tight box; allow them to remain until they are well heated; then return them to the press, and add, say, to the production of thirty bushels of apples, six or eight gallons of water, and you can press from one and a half to two barrels of vinegar from the same, and a good article at that. Vinegar made in this way will sour much sooner than otherwise.

### DOWNING'S MULBERRY.

In reply to inquiries, Mr. E. Williams, Mont Clair, N. J., said: I have been very successful with the Downing mulberry. We have employed this kind of fruit, for more than two months in succession, in making pies. I think it can be raised with great satisfaction and profit to producers.

### BLACK CURRANTS.

Mr. M. Sill, Auburn, N. Y.. inquired why the Club did not recommend the cultivation of the black currant.

Mr. Solon Robinson.—I should like to know where there is a market for them.

Mr. Thomas Cavanach.—They sell for double the price of the red currant.

Mr. Wm. P. Peck.—They make excellent jelly, and are used for puddings and pies. The variety called the Black Naples is the best.

### HOW TO GROW HICKORY TREES FROM THE NUTS.

A farmer inquired how he must proceed to grow hickory trees from the nuts. "When shall I gather the nuts, and when should they be planted?"

Mr. Wm. B. Peck.—Let the nuts remain on the surface of the ground, covered with a flat stone all winter. In the spring remove the stone, and, if the shells have been opened by the frost, they need only to be planted in a mellow soil, about as deep as corn should be, slightly cracked. But, a better plan is, to go to the woods, and dig up seedlings which have sprung from nuts that were planted by the squirrels. Chestnuts and any other nuts may be planted in the same manner, with satisfactory success.

Dr. J. M. Crowell.—All such nuts should be collected when they are fully ripe, and planted in drills, in the fall, before the germs have had time to dry so as to destroy their vitality.

The Chairman doubted the suggestion that squirrels plant nuts. He said, in his experience, squirrels store the nuts in some hollow log or tree, and eat them.

### DISCUSSION ON TOMATOES.

The table was crowned with a quantity of "fine tomatoes," about the size of the peach tomato, which is a new variety. Mr. Doty stated that he had tested the earliness of this variety, and found that the fruit will ripen some eight or ten days earlier than the common red tomato.

Dr. J. E. Snodgrass.—The tomato is an excellent fruit. Very few people really appreciate its value as a tonic among our most delicious articles of food. Medical men have learned that the tomato contains a medicinal principle similar to mercury, which has a very excellent effect on the liver, and it is also a valuable alterative. There is one method of cooking the tomato, which is seldom practiced, but which ought to be adopted, namely, broiling them as beef or mutton is broiled. Let them be broiled without breaking the skin; and after they are thoroughly cooked, open them, and add butter and salt. Cooked in this manner, tomatoes make an excellent dish.

### BUCKWHEAT FOR STOCK.

Mr. W. Pettingill, Hartwick, Otsego county, N. Y.—I send a package as a sample of a kind of buckwheat raised in this vicinity. It goes by the name of merino buckwheat. Its qualities are, a sure crop every time, and its great yield. It never fails of a good crop like the other kind. My crop last year was 67½ bushels to the acre—a sample of it I send to you. It does not make good flour for man to eat, but is relished by all kinds of stock and poultry. The flour is yellow and a little bitter. It has been raised in this vicinity over twenty years. The other kind of buckwheat is, with us, a little like a lottery. Perhaps we get a crop, and perhaps we don't. We prefer to buy what flour we want to eat, rather than run the risk of sowing and not reaping. It is a little earlier than the other kind, and can be sown any time after spring work is done, for it don't fail to fill in midsummer. We generally sow it from the 10th to the 20th of June. The blossom is the same color of the leaves, so you never notice it being in blossom.

Adjourned.

## September 10, 1867.

Mr. N. C. Ely in the chair; Mr. John W. Chambers, Secretary.

### CURRANT CUTTINGS.

To an inquiry as to the best method of starting and managing currant cuttings, several members responded.

Mr. Thomas Cavanach.—Several cuttings can be made from one cane. I would rub off all but two eyes of the part which is to be in the ground, and the soil should be well prepared.

Mr. P. T. Quinn.—Currant wood can be turned into a plant the year it is grown, by setting any time from August to November. I would make a square, clean cut, have the ground mellow, that the young rootlets may meet with no obstructions, and then push the dirt closely around the bottom of the cutting. The fall is decidedly the best time to commence operations, because in so doing one gets a two year's growth in one. If it is very dry, some mulching will be required, but generally, at this season, the ground is warmer than the atmosphere, and ninety-eight per cent should live. In starting for making sales of roots, I would have the rows three and a half feet apart, and the plant eight inches in the row. The currant is one of the small fruits which has been very much neglected. The amount of sales is very large, far more than people would imagine, and there is an opportunity for an indefinite extension of its cultivation.

Mr. Thomas Cavanach.—It should be understood that these directions do not apply to all kinds of cuttings.

Mr. Wm. Lawton.—Similar directions apply to gooseberries. I have bushes of this fruit which have been planted from fifteen to twenty years. Two-thirds should be thinned out annually. These and currants should be well manured every year. I never fail of having abundant supplies.

Mr. Solon Robinson.—Mr. Hite, of Morrisania, who is a very successful cultivator of currants, has repeatedly stated that the plan recommended by Mr. Lawton for the cherry currant will not answer.

The Chair.—The currant has extraordinary durability, both regarding the life of the wood, and the season in which its fruit can be picked.

### PRUNING FRUIT TREES.

Dr. Israel Jarvis.—In trimming peach trees the old wood should be taken out by degrees, for the fruit comes on new wood.

Mr. P. T. Quinn.—This suggestion is correct regarding this tree, but it will not apply to pear trees, because the fruit spurs become permanent, and, gradually increasing in size each year, continually bear fruit on the same spurs.

Dr. Wm. B. Peck.—Pruning is done in much less time than it should be. Farmers take a saw, or perhaps an axe, and remove large limbs, when they should take off the ends of limbs. I have spent a whole day in profitably trimming one tree. If trees are rightly managed from the start, the thumb and finger nails will do much of the pruning—a pruning knife certainly will be a tool large enough.

### SUBSOILING.

Mr. C. W. Sexton, Monitor, Tipton county, Ind., asked for information on this subject.

Dr. Wm. B. Peck said the subsoil might be brought to the surface, if there was manure to mix with it.

Mr. P. T. Quinn said the soil only needed to be lifted, when it would completely pulverize, while lumps would only be on the surface.

Mr. Solon Robinson said the soil in that county is four inches of black mold; the subsoil is barren clay, which would do great damage if brought to the surface.

Mr. N. C. Meeker said the result of experience of such soils is to bring the subsoil to the surface a little at a time each year.

### HOW TO MAKE GOOD BUTTER.

Mrs. N. Noman, Adrian, Mich.—Having read a good deal on butter making, I thought I would write a little on the subject for the benefit of farmers' wives. Set your milk where the wind will not blow on it, for the wind dries the cream, and dried cream will not make butter. In warm weather keep your cream still, for if you want your cream to become sour stir it often. Very sour cream will not produce a good quality of butter. In cool or cold weather, don't think that you must let your milk set until it is sour before you take off the cream. Forty-eight hours is a sufficient length of time for milk to produce all the cream it is capable of producing. In a right temperature it will rise in a less time. Much poor butter is the result of bad management of the cream. It is a good plan in warm weather to save strippings, about a quart night and morning from each cow, and churn every day. Churn your cream as cool as possible in warm weather. Much butter is spoiled by churning the cream too warm. If your butter comes rather warm, put in twice the salt you usually do, work your butter just enough to mix the salt well through it, and set it away in a cool place for twenty-four hours, then take it up and work it over. Much of the salt will be dissolved and will work out. Thoroughly cleanse your butter with salt. Use no cold water about your butter, for you cannot cleanse butter or any other lump of grease with water. Some women talk as though butter was not fit to eat unless it is first washed with cold water. If butter is not fit to eat without being washed with water, it is not by being washed. Water always damages butter. Butter that is washed with water is not fit to pack, for it will not keep. When the brine that oozes from your butter, as you work it, is clear, that is, clear from milk, it is worked enough; don't give it another stroke, except to get it into shape. Pack your butter in perfectly clean vessels, and keep it well covered with strong brine. When you use your butter, set it on the table just as you cut it out of the tub, for it is injured if worked after it has been packed. If all butter was made after this plan, we would see but little that is poor. I am very jealous of women's rights, and one is to make good butter, and many other good things, and be amply rewarded for it.

### CARE OF FARM IMPLEMENTS.

Mr. S. Edwards Todd.—Most people seem to think that if their tools and implements are protected from the influence of the sun, they suffer no injury during the rainy and lowering weather. But this is a serious mistake. The influence of any, and all kinds of weather, is always more or less injurious to farm implements, whether the various parts are made of iron, or a portion only of iron, and the remainder of wood. As a general rule, the injury and damage done to farm implements by unnecessary exposure to the influence of the weather, wears out the working parts more than all the labor that is performed by them. And this is more emphatically true along the seacoast, where the sea breezes, highly charged with saline material, come in contact with those parts of implements which have polished steel or iron surfaces. Several hundred miles away from the sea-shore, mechanics experience little difficulty in keeping their saw-blades, and other steel tools, from rusting. But, near the salt water, steel plows, saws, cultivator-teeth, polished bearings of mowing machines, steel rake-teeth, and all such implements, rust very quickly, when not in actual use, if the polished surface is not oiled or varnished. Plows are frequently left standing in the ground with the damp earth in contact with the polished mould-board and land side. The consequence is that a thick scale of rust is formed over the entire surface, thus destroying more metal than would actually wear off in one or two days, when the implement is in use.

The true way to take care of such tools, is to wipe the polished surface dry, and oil it with any kind of oleaginous material which has no saline material in it, or to varnish the surface. Salt grease, or oil of any kind having salt in it, will soon form a heavy scale of rust on a bright surface of iron or steel.

Mowers and reapers are frequently made entirely of iron and steel; and because the parts are all made of such material, it is taken for granted that the weather cannot do them any injury. But when exposed to alternate sunshine and rain, the polished surface of the bearings soon has a scale of rust on one side of the journals. The consequence is, that after a little exposure of this kind, the bearings begin to wear out on one side. Rust renders the smooth surface rough, so that in a short time either the bearings, or the boxes in which the polished bearings work, are so badly cut out that those parts must be removed. Instead of wearing out, the machines rust out, simply for want of proper protection from the weather.

The wood work of many kinds of farm implements often gives out, in consequence of water in the joints, which soon rots the tennons, and the wood at the mortises. Almost all kinds of wooden farm implements fail first at the joints. Protection insures their durability. Sleighs are often left standing on the wet ground, when a thick rust will soon form, and thus rust away more iron than will be worn away in a month, when the implement or machine is in active service.

As soon as a farm implement has performed its last task, for the season, let the parts be cleaned, oiled and stored in some dry place. By taking a machine apart, it can many times be elevated to the attic of a hay barn, supported by a few plank, or poles.

Adjourned.

## September 17, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### ANGORA GOAT.

A letter from Mr. Deihl, the American agent for getting a new stock of goats, dated at Constantinople, was read. Mr. Deihl stated that he had visited the interior of Asia Minor, the native place of the Angora, Cashmere, Thibet, and other goats, of which he saw thousands, and he learned many interesting facts. There are about one million and a half of these goats, which yield a fleece of from three to six pounds each, and three millions of pounds are sent to England. Under directions from our Department of Agriculture, he had purchased two hundred head of the best he could find, and he had collected a variety of plants and minerals for analysis and examination on his return. With regard to the agricultural appearance of that country, the chief feature was the many gardens and vineyards, which are in a highly cultivated state; but as to farming, as we understand it, the condition is very low. Only the most primitive implements are in use, such, perhaps, as existed at the time of Noah; there are no such things as agricultural fairs, meetings or discussions; the people will not learn, while two-thirds of all that the land produces goes for taxes, and yet it is a very pleasant and fruitful country, and the soil has a capacity for yielding large quantities of all kinds of productions.

### SEED FROM SMALL POTATOES.

Mr. T. W. M. Caslin, Brownsburg, Ind., inquired whether it is best to plant small potatoes for seed.

Mr. S. E. Todd.—I experimented five years, planting the smallest seed every year, and the result was a crop so small as to be utterly worthless. The first year or so they were of good size.

Mr. N. C. Meeker.—I do not think this hardly meets the case. The question should be decided on the maturity of the seed. If one will constantly pick out immature seed, of course degeneration will follow, whether it be large or small. My impression is that small seed may be so matured, and have so much vigor as to be as good as large seed. There have been a great many experiments; some point one way and some another.

The Chairman.—I hope every one will visit the fair to see the seventy varieties of potatoes shown by Dr. Hexamer, and the one hundred and five varieties exhibited by Mr. D. T. Heffron, of Utica. Such an exhibition may not soon be seen again.

### PLOWING IN BUCKWHEAT.

Mr. J. F. Simmons, Iowa Falls, Iowa, stated that plowing in buckwheat had been recommended by the Club, but in his experience it had proved an exhausting crop, and poisoned the soil.

Mr. S. E. Todd said that this was his experience.

Mr. Crane.—I have found it a great benefit to plow under buckwheat, for this is the question, not whether it is an exhausting crop to raise for bread. Still, the best crop of corn I ever raised was after buckwheat. I grant it wants cultivation, and perhaps for want of this others are so unsuccessful. Mr. Simmons also inquired whether it is safe to put out willow cuttings in the fall, to which Mr. Crane answered that it is not safe.

### A NEW PITCHFORK.

The Montgomery Fork Company of New York presented this article, which is so constructed that if a tine breaks, another one can be inserted; and it is strong, and seems to have advantages over others.

### HOT-AIR STOVE-PIPE DRUM.

Mr. E. P. Morse, Batavia, N. Y.—This has a central cylinder, a cone-shaped end, and several air-tubes which retain the heated air, whence it is radiated through an apartment. If it is what it is claimed, it must be a great saving in fuel.

### LIGHTNING APPLE-PARER.

Messrs. Sargent & Co., New York, exhibited one of Goodell's lightning apple parers. This is a surprisingly new device. A horizontal motion gives all the results attained hitherto by a circular one, and the fruit is pared with fewer movements than was supposed possible.

### HOW TO START APPLE SEEDS.

Mr. R. S. Hough, Spencer, Clay county, Iowa.—This is a bran new country, homesteads plenty, land good, close by rivers, grass abundant, and can be cut from June to September; settlers arriving, and we want more. How shall we raise apple trees from the seed?

Mr. N. C. Meeker.—Apple seeds need a rich, well-prepared seed-bed. It is generally granted that they should be frozen. They should be guarded from mice. It would be safe to sow them in the fall, in a box with a wide surface, where it can be watched, or in some sheltered, quiet place, surrounded by boards, might do, and then transplant in the spring, in nice rows, with a plenty of room. Give them thorough cultivation, and either bud in the fall, or graft the next spring, but make only one tree from one seed. Allow no root-grafting. Give care, and you will have an orchard your great-grandchildren will brag about.

### PLANTING PEACH TREES.

Mr. G. C. Gabert, New Salem, West Virginia.—Is it best to plant peach trees in the fall or spring, and is a locality facing west and south preferable to one facing north?

Mr. N. C. Meeker.—I have had the best success in spring planting. One year's start can be had by cutting them down even to a stump, that a new head may be formed. It is almost impossible to get a growth good for anything out of old branches. One-third of the growth should be cut back for at least three years afterward, to make the tree send out fine bearing-wood low down; otherwise the fruit will come on the extremities of the branches, which are likely to be frost-bitten. The cutting-back should be done early in the spring, so that the fruit-wood can harden well by September. Cultivation should be constant through the summer months, but it should cease in July, to prevent a fall growth, which is almost certain to winter-kill. It should be borne in mind that all fruit has its foundation laid the year before, and that no tardy fall or spring cultivation will do the least good, but on the contrary will be a positive injury. As to situation, the peach is well known to love the sun, and that the warmest location is to the southwest. But one thing is most important; this is an elevated situation. The higher the ground for a peach orchard, the better. It is true, the fruit is sometimes blasted in high ground by an east wind, but three times out of five there will be peaches on high ground, when there will be none in valleys.

### IMPROVED VARIETIES OF WHEAT.

Mr. S. Edwards Todd.—Among the numerous varieties of white winter wheat which are now in successful cultivation, in this latitude, we may mention three which stand pre-eminently above all others in point of prolificacy, earliness, stiffness of straw, and certain other good qualities which characterize desirable varieties of this kind of grain. The varieties alluded to are the Weeks wheat, the Soules wheat and the Diehl wheat. Of course these different varieties have their advocates, who esteem one superior to another. But these kinds have proved themselves to be all eminently worthy of cultivation, and where the seed has been selected with proper care for several successive seasons, and when the grain has not been allowed to degenerate by injudicious cultivation, there are no other varieties that will excel these just alluded to. A variety of white wheat has long been sought that would be midge-proof.

Mr. E. A. King, King's Ferry, Cayuga county, N. Y., who cultivates the Weeks wheat in preference to all other varieties of white wheat, writes to the *Times* that "this wheat was originated some years since by J. M. Weeks, of that town, who selected one or two heads among his other grain, and cultivated it with care, until now, an immense amount of territory is sown with the Weeks variety." Mr. King writes that on his farm, on the eastern slope of Cayuga lake, where the soil is admirably adapted to the production of winter wheat, the Weeks wheat is eight to twelve days earlier than any other variety, and, at the same time, more productive than any other variety raised in that vicinity. Besides this, the growing grain is not disturbed by the wheat midge and the weevil.

Our government has expended large sums of money for the purpose of obtaining a variety of white wheat that would possess sufficient hardiness to withstand the rigors of our northern winters, and at the same time be sufficiently early to mature before the wheat midge commences its ravages; but, thus far, all effort has failed. It is a source of great congratulation, however, to learn that American farmers are beginning in earnest, and in the right way, to improve this great staple product of the farm. The value of this single experiment to our nation will never be computed in dollars and cents. Still there is room for further improvements in seed wheat. Adjourned.

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## September 24, 1867.

Mr. **Nathan C. Ely** in the chair; Mr. **John W. Chambers**, Secretary.

### BAD BUTTER.

Mrs. D. Wood, Venice, N. Y., stated that there is more poor butter this year than common. Not one farmer in ten has a suitable place to set milk. Most pantries are too warm, and cellars are too damp. Then there is not sufficient care in skimming the milk. A good milk house is indispensable. An ice house is important.

Many farmers waste time enough every year to build an ice house. No woman, however neat and careful, can make good butter in warm weather without a proper place to set the milk. To this must be added due attention to skimming the milk.

Dr. Isaac P. Trimble.—In the Philadelphia market there is a quality of butter which commands double price. They who make it always have spring houses. In building barns and houses for the farm, the spring is the commander of the situation. Frequently more attention is paid to the spring house than to any other structure, and I have seen such twenty or thirty feet long. The floor is paved, or it may be of gravel, over which the water runs a few inches deep, and in this the milk is set. The temperature being always the same, probably about thirty-nine degrees, the questions about skimming the milk and churning are of secondary importance. They who have these spring houses have no difficulty in making good butter.

Mr. Wm. Lawton.—The difference in the quality of milk in different cows is extraordinary. Some milk yields double the quantity of butter from double the amount of milk of other cows. The feed has little to do with it. For cows to furnish milk for the city, all that is required is quantity. For family use, I would advise every one to be very particular to get cows giving rich milk. Still, it is important that there should be a variety of good feed. This holds true with regard to the food of human beings. In one part of Scotland, where the food was the same constantly, the people became imbecile. Some kinds of food are required for the nourishment of the brain; other kinds for different parts of the body; for one will not answer for all.

Dr. J. C. V. Smith.—Some years ago I was acquainted with the fact of a farmer having a large quantity of bones which he could not pulverize, and he put them on one part of a pasture; there the grass, after a time, grew most prodigiously, and the cows preferred feeding on it; when put in other lots, where the feed was good, they fell away. People who eat much butter have better teeth than they who eat less. It is the phosphate of lime, or phosphoric acid, which develops the teeth. According to statistics twenty millions of teeth are drawn by the dentists of our country every year because people do not eat food which contains enough phosphate of lime, and which is contained in butter and in unbolted wheat bread. This is at a cost of $20,000,000, or one dollar a tooth.

Mr. N. C. Meeker.—I know that Philadelphia butter is celebrated. There is a sort of a ring of farmers who command high prices for their butter, and others strive for years, taking the greatest pains, to get into this ring, and when they attain this object, it is said they make their fortune. Their butter goes only into particular families, whom they supply year after year. The utmost cleanliness, even to fastidiousness, is practiced, and when the butter is taken to the city home, it is handled with the same care they would handle a keg of gold. In Baltimore there is the same condition. There, this first class butter brings a dollar a pound. Now, Pennsylvania is a very large State, and it abounds in springs, but the butter of that State never is heard of in the markets of the world, like the butter of many counties in the State of New York, and of the Ohio Western Reserve. I have eaten that Philadelphia butter, however difficult it may be to get a taste of it, and confess it is very good, though there is a taste of its being washed in water. But it is destitute of that crisp, sprightly flavor which comes from the fine blue grass pastures of higher latitudes. Philadelphia butter, it seems to me, is more esteemed because bad butter there is so common.

### APPLES.

The Chairman showed beautiful specimens of Roxbury russets and Rhode Island greenings, growing on his farm in Connecticut. It was a cheerful sight, while so much of the fruit in the east this year is the prey of various insects.

Dr. Isaac P. Trimble spoke of the great show of fruit at the meeting of the American Pomological Society recently held at St. Louis. There were 2,400 plates of fruit, an immense variety of grapes and peaches that astonished, by their size and brilliant color. He also visited the vineyards at Herman, and saw hundreds of acres of grapes. There the Delaware grows to perfection. He considered that the question of a supply of wine for this country is settled, for the vine, beyond all doubt, will thrive on the banks of the Mississippi and Missouri. In particular was he surprised with the exhibition of fruit from Egypt or Southern Illinois. Well known varieties of apples, peaches and pears he scarcely recognized, because they grew to such enormous size. On his return, he stopped at Pittsburg, and estimated the crop of Mr. Knox's grapes at one hundred and sixty tons. The secret of success lies in skill and in good cultivation. Two four-horse teams go into Pittsburg every working day of the year and haul out manure.

### MANURING FOR WHEAT.

Mr. James Goodwin, Bridgeton, N. Y., inquired whether, on sandy loam, it is best to plow in long coarse manure before sowing wheat, or to apply it afterward.

Mr. John Crane.—I should plow and cross plow, and turn the manure under lightly.

Dr. Isaac P. Trimble.—Surface application of manure is considered best in these days. The theory is, that nothing is lost by evaporation, that rains wash the fertilizing properties into the soil, and that being on the surface it acts as a mulch and prevents winter killing.

### WHAT IS A GOOD YIELD OF HONEY.

Mr. E. G. Halcomb, Brasher Iron Works, St. Lawrence county, N. Y.—Thinking to draw out something on the subject, I send a report of a few of my best hives. The spring was very cold and backward. Soft maples blossomed the 4th of May. The 25th was the first warm day. Plums were in blossom the 30th; apples the 5th of June; white clover the 9th. My best hive gave me 179 pounds cap honey; others 132, 117, 110, and so on down, without swarming. My two best new swarms made 104 and 103 pounds, respectively, beside filling their hives, which have sixty pounds honey in each. These were all black bees, except one swarm, which was a cross with the Italian. I had two stocks of Italians, and got one swarm and seventy-two pounds cap honey. With me they have proved decidedly inferior to the black or common species in everything, except robbing. Now you will find them trying every hive in the yard, and they are worse in the spring. Of course, I don't raise queens for sale. My whole apiary averaged forty-five pounds surplus honey to the hive, old and new.

### HOW TO RAISE A LARGE CROP OF INDIAN CORN.

Mr. S. Edwards Todd.—The right kind of management is as essential to the production of a large crop of Indian corn as to raise a bountiful crop of wheat. Some farmers will raise just double the number of bushels of grain on a given soil that can be grown by other men. This is a fact that cannot be refuted, and the reason for it is to be found only in the system of management adopted by those who cultivate the soil. Indian corn likes a dry, lively and warm soil, in which there is an abundance of fertilizing matter. It is the height of folly to attempt to grow a heavy crop of Indian corn on a cold, damp, heavy soil, which is not in good state of fertility. If the usual time for planting Indian corn occurs about the middle of May, and the ground is not in the best condition for being plowed, better defer planting till after the first of June. rather than to plow the ground and put in the seed too early in the season.

There is never anything gained, but a great loss sustained, by plowing the land—especially heavy and foul land—too early in the spring, after the growing season has commenced. The main idea is, to defer plowing the ground and planting the seed, until the whole earth has been warmed by the sun to such a degree that the seed will vegetate quickly, and the young plants grow rapidly. If the seed be put in too early, the young plants are apt to get chilled by cold nights and chilling storms of rain. The first step toward producing a remunerating crop of Indian corn is to prepare the land. If every portion of a given field is not sufficiently dry, let under-drains be made, so as to relieve the soil of all surplus water. If necessary, let the entire month of May be occupied in rendering the soil dry. A bountiful crop of Indian corn cannot be raised where the land is charged with an excess of moisture during the former part of the growing season. Another point of eminent importance is, to defer plowing the ground until the seed is ready to be put in, as late plowing, especially where the ground is infested with noxious weeds, will save all the labor of one hoeing of the young plants. When the land is plowed, let the plowman commence in the middle of the field, and turn the furrow slices all inward. By this manner of plowing, all ridges half broken up, and middle furrows, will be avoided. If the soil rests on a heavy and cold substratum of calcareous clay, do not plow too deep with the common plow. A subsoil plow may be employed when the ground is of this character, with satisfactory results. Another consideration, indispensably requisite, is manure of some kind. If coarse barn-yard manure be the only fertilizer employed, let it be spread broadcast, and plowed under as soon as it is spread. If there is a sufficient amount of manure to cover a ten-acre field one inch deep, better spread it on five acres, and plant only half the field, than to attempt to cultivate ten acres with only a light sprinkling of coarse fertilizing material, as more grain may be grown on five acres, when heavily manured, than on ten acres having only a light dressing of fertilizing material. If the corn is to be manured in the hill with guano, rawbone superphosphate, or with hen manure, it will pay to remove the soil where each hill is to grow, and spread the manure over an area of eighteen inches in diameter, after which it should be lightly covered with mellow earth before the seed is planted. A large number of farmers could collect several hundred pounds of hen manure, which would be almost as effective in producing a bountiful crop of corn as a dressing of Peruvian guano. These general suggestions will be sufficient to enable almost any practical farmer to supply the necessary details in practice for producing a bountiful crop of corn with the smallest amount of manual labor. Adjourned.

## October 1, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### DISEASED CHERRY TREES.

Mr. J. E. Stevens.—When our cherry trees first leaved out they soon became covered with black, greenish lice; the leaves curled and formed into bunches, and many of the twigs died. Though the tree was full of blossoms, they bore no cherries.

Mr. Wm. Lawton.—Cherry trees should be kept thrifty. The Oxheart is a good cherry when perfect, but it seldom is perfect in Westchester county, especially in a wet season. The reason is because the stem of the cherry absorbs so much moisture that the fruit falls off before it is perfectly ripe. Everything in nature has an animal enemy, both among animals and in vegetation. If we want to get rid of insects we must either change the atmosphere or else the condition of the tree or animal.

Dr. Wm. B. Peck.—It is a question in my mind whether the state of the atmosphere has much to do with insects troubling trees. People who have plenty of food and sleep are rarely troubled with disease. Trees that are well taken care of and have a plenty of manure will overcome the effects of insects or disease.

Dr. Isaac P. Trimble.—The most thrifty trees are usually the ones attacked the most.

Dr. J. E. Snodgrass.—In the Shenandoah Valley I noticed locust trees whose leaves were eaten by worms, and yet this year they are as healthy as ever they were. The fact of the worms eating the leaves don't seem to affect the trees much.

Dr. Wm. B. Peck.—Dr. Trimble is undoubtedly correct in saying the most thrifty trees are the ones most likely to be injured.

What I meant to say was, that thrifty trees are not so easily hurt as those in a less thriving condition.

### ANTS.

Mr. H. E. Robinson, Warsaw, N. Y.—Sometime since I read in a work on Natural History that lice serve as a kind of dairy to ants. The lice secrete a sweetish liquid substance, which is expelled either at the solicitation of the ants, or when the vessel becomes over charged, and the ants even provide for them in the winter. I intend to make observations in regard to the matter when I get time.

Dr. Isaac P. Trimble.—Ants are as kind to the lice as dairy people are to their cows. I have seen an ant go to a louse and partake of a transparent substance which they exhale. If I were sick, I should like nothing better than to have a rose bush near my window, covered with lice, so that I could watch them and study their habits.

Mr. Thomas Cavanach.—The doctor certainly never had much to do with green houses.

Mr. Hamilton.—I have here an insect exterminator, costing one dollar and fifty cents. It is of tin, round, and about eight inches long, with a sharp sprout or tube at one end, and a hollow globe made of rubber at the other. Tobacco or cinnamon is placed in the tin barrel and lighted. By pressing the rubber bellows the smoke is forced out in a continual stream at the small end of the fumigator. The machine resembles a common large-sized syringe. A little girl and myself have killed over three hundred bed-bugs in a short time with the fumigator. From Maine to Oregon, I have found that the people generally think insects a great nuisance. I suppose you are not troubled much with bed-bugs in New York, but I have seen places where they were very bad.

Mr. Thomas Cavanach.—I know of several kinds of bugs that are not affected at all by smoke of any kind. As for bed-bugs, I am never troubled with them.

Mr. Hamilton.—I see I am misunderstood. I claim that I can kill all kinds of insects on cattle, sheep or dogs.

Mr. Wm. Lawton.—I think the instrument is very useful for applying smoke of all kinds.

Mr. John Crane.—We know that bed-bugs often get into holes and cracks, so that it is hard to get at them. I think this fumigator is a good thing to drive them out. I have cured chickens of the gaps by using smoke.

### PATRIE'S IMPROVED PUMP FOR CATTLE.

The agent showed a model of this simple pump, which excited general admiration. We will suppose a churn to be a well, filled with water, and the dasher bottom to be a round piece of board without holes, and the dasher handle hollow clear through Now, it is evident that the dasher will float on top of the water, and when it is forced down into the churn the water will of course run up through the dasher handle out of the top. The pump is similar. It is fastened to the floor in such a manner that when the cattle walk up to drink, the water pours out in a constant stream. It is claimed that water can be raised with this pump five hundred feet.

Mr. J. M. Allen.—I commend the pump, for there are many farms that would be of great value if water could be had on them conveniently.

### COMBINATION CARPET-STRETCHER AND TACK-DRIVER.

Dr. Taylor.—I have here an invention for tacking down and stretching carpets. It is made of wood and metal. It is about the size and length of a broom handle. A small tin pipe runs down alongside of the stick to a small iron mouth at the bottom, where there is a spring hammer and a piece of iron with teeth, which takes hold of the carpet.

The operator stands, putting the tacks in the small pipe at the top, and placing the "teeth" on the edge of the carpet and stretching it as far as is necessary, then pulls a string, the hammer goes down, and the tack is in. This machine is very simple. It costs four dollars at retail.

### FRUIT IN CENTRAL ILLINOIS.

Mr. F. K. Phoenix, Bloomington.—We have raised here not less than fifteen thousand boxes of peaches, which sold at an average of one dollar a bushel. These, with our small fruits, give much less for our doctors to do.

### VALUE OF CORN-HUSKS.

In the proceedings of the Warsaw, Ill., Horticultural Society, the statement was made that corn-husks are worth seventy dollars a ton in St. Louis, where they are used for mattresses. To save the husks, pick the corn without husking, draw to the crib, and then husk at a convenient season. They should be baled like hay.

### CLOVER.

Mr. Charles W. Vinens, Jefferson county, Illinois.—I have a thirty-acre field of land, which has been shamefully skinned by former owners, who raised corn more than twenty years. I am desirous to make the land as fertile as possible. A year ago I sowed two bushels of clover seed on fourteen acres of oats and wheat; however, there was a good stand on only a few acres, which had been manured. Last winter I again bought two bushels of clover seed with the intention of sowing it last spring by itself, but the frequent rainy weather prevented. Seed being high, costing nearly ten dollars a bushel, I wish to raise in future my own seed, that I may always have a plenty to scatter over the whole farm. This fall I intend to put all the manure I can scrape together on six or eight acres, and make the land ready for sowing. Which is the best time to sow clover seed by itself, and how much to the acre? Which is the best time to sow gypsum on clover, and also on wheat, and how much to the acre? Is raising clover seed for sale a profitable crop, and how much will an acre yield? Is it necessary to repeat the sowing of gypsum on clover or wheat every year? If gypsum cannot easily be procured, will lime answer as well? I learned by sad experience that western farmers must rely on clover to make and keep their land productive; for stable manure is not here in sufficient quantity, as horses and cattle are not usually kept up. Besides, as Mr. Robinson says, clover is the cheapest manure. Lightly to manure one acre with stable manure cost me at least four dollars for a hired hand, not counting the use of the team. With clover I can do it cheaper, and I think better, too. There are, alas, too many farmers who kill land, beasts, and even man, by overwork. In my eyes, one is as wicked and abominable as the other.

Mr. N. C. Meeker.—Clover seed is to be sowed by itself as early in the spring as the ground can be put in good order. We should say that two bushels to fourteen acres is very heavy seeding, and as much again as would be required on good land. Six or eight bushels of plaster to the acre will be as good as a hundred, and it will last four or five years. It should be applied early in the spring, and if possible on a wet day, certainly before the spring rains. This is important. Lime cannot have the same effect. In Pennsylvania, plaster is used in connection with lime. Where the land is rich, plaster will do little good. We have never raised clover seed for market, and would like to receive an account from those who have. The best seed comes from a crop mowed late, after the cattle have eaten it down in June. A farmer can save his own seed by having a tight floor under the clover mow, and sow the chaff; but he will be likely to have some seeds of weeds, though perhaps no more than in the seed he buys.

Mr. G. Smith, Ionia, Michigan.—You say six or eight bushels of plaster is as good as one hundred. Now, I have found that half a bushel is sufficient on clover, if applied every spring. Two bushels of clover seed to fourteen acres is not heavy seeding, but rather light. My rule is two bushels to ten acres, but many recommend a peck to the acre. Clover seed is raised extensively in this region. The general practice is to cut the first growth for hay, about the first of July, and let it grow again for seed; it is then fit to cut the forepart of October. We cut it with a reaper, leaving it in large gavels. The yield is from one to six bushels per acre. I would recommend Mr. Vinens to sow on the six acres, which he proposes to manure highly for clover next spring, either barley or wheat, for I think if he sows the clover alone, the weeds will grow up and choke the clover as much as a crop of grain. I would sow the clover seed before the last draying, and then sow one bushel of plaster per acre, about the time the grain was coming up. Let him try this plan, and if his land is sandy, he will be surprised at the result. The clover will grow up after the grain is cut, and blossom, and if the season is moist it will fall down. The man who should manure his land for clover in this State would be laughed at, we expect, unless by clover itself. We don't think much of barnyard manure; clover and plaster are our great fertilizers, if we use them properly our land grows better every year.

Mr. S. T. Botsford, Huntington, Conn.—There seems much difference in the opinion of farmers regarding the use of plaster. We need facts, such as actual experience give. It is well established that plaster suits clover to a charm, and for one, I would be glad to know whether it suits any other crop as well. Calling it ten dollars per ton on the ground, will it pay to use it on such crops as wheat, rye, oats, buckwheat and corn? I have as yet tried plaster on only one crop, and that was clover, and I am perfectly satisfied that in this case one dollar's worth of plaster was of more value than the nine dollars worth of commercial manure used in the same field. Some say it is better to plow or harrow it in than to let it remain on the surface. And is plaster as beneficial on turf ground as on land that has been plowed? Will it bring in clover and grass on old barren pasture lots that are too rocky to plow? If so, large portions of the country, and especially New Englanders, are greatly in need of a knowledge of the fact. The great and crying want of farmers in this section of country is manure in some shape or other, and for one, I am quite tired of paying sixty dollars per ton for patent manures. Adjourned.

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## October 8, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### HINCKLEY'S KNITTING MACHINES.

Mr. J. E. Harding exhibited one of these machines. It knits all kinds of goods, from suspenders to quilts; it has few parts, the fabric is woven flat with a selvedge; it widens and narrows; there is only one needle, which is similar to the needle of a sewing machine; it will take a great many different kinds of stitches, which can be changed while in operation, and it has a self spooling apparatus. Price twenty-five dollars.

Mr. William B. Harrison.—I saw this machine while it was in process of construction, at Norwalk, Ohio, and it seemed to embody the true principles of what a knitting machine should be.

Mr. Solon Robinson.—I like the looks of this machine well enough, but there is one thing I want to know first. Is this exhibition made for the purpose of selling patent rights, or is it made by manufacturers having the machine for sale?

Mr. Harding.—We want to sell the machines, and do not care about selling rights.

Mr. Robinson.—Then I am willing to recommend it. People want such a machine, and from what I see of it, it looks as though it would suit them. Of course, we cannot tell much of the work it is doing before us, but it is reasonable to suppose that they would not manufacture it unless it would do what is claimed.

### HOP LOUSE.

Mr. Salisbury, Memphis, Mich.—I, with many of my neighbors, have just commenced the hop business, but our crop this year is almost entirely destroyed by the louse. Now, we would like to know if there is a remedy, so that we can decide whether it is best to continue the business.

Dr. Isaac P. Trimble.—A few years ago the revenue of the British government was so seriously affected by the falling off of the tax receipts arising from hops, that a committee of the House of Commons was appointed to examine and report as to whether there is a remedy for the louse. After a long investigation they reported that the only remedy lies in having a large number of children employed to pick off the lice, but this is to be done only at a particular stage of growth, for if only a few hours pass it will be too late.

### NEW USE FOR PAPER STOCK.

Mr. Solon Robinson showed a bonnet made of paper, by the Emporium Hat Company of Watertown, N. Y. This was from Manilla pulp, molded on a block, then spread with dissolved shellac and covered with woolen flock or clothiers' waste, and pressed till it has a velvet appearance. These may be any color. At present the demand is great, but they can be made at less cost than by any other process, not exceeding ten cents.

### PEAT.

Mr. G. P. Tripp, Union, Broome county, N. Y., sent a specimen of peat taken from under alders and large trees.

Mr. Solon Robinson.—This is peat from the lower part of the bed, and if taken out and molded, and dried, it will make good fuel. It is also valuable for manure. Two loads mixed with one of stable manure is of more value than three loads of common manure. It is also valuable as an absorbent, when added to all kinds of liquid manure. There is a plenty of peat all through the country, and yet people do not know its value.

### LEAD AND TIN PIPE.

Mr. A. A. Woolsen, Lisbon, N. Y., inquired of the Club its opinion on the lead-incased tin pipe, manufactured by the Colwell, Shaw & Willard Manufacturing Company. Quite a discussion followed, in which the pipe was indorsed, both as to cheapness and safety, as it had been before by the Club; but a difference arose as to the danger of common lead pipe. Dr. Snodgrass thought we ought not to be alarmed, and that the danger of using it had been exaggerated.

Dr. J. C. V. Smith.—When water was introduced into Boston, Dr. Dana wrote a book on the subject, to prevent the use of lead pipe, to which it was answered that some people would not be attacked by lead poison, and the average was stated at one in one thousand, and it was adopted by the city authorities, mainly because there was no substitute. Lead pipe is of great antiquity. When I was in Pompeii, I saw large lead pipe broken off where a wall had fallen down. They had no other way of making it than to cast it in halves, and then solder them together.

Mr. H. B. Smith.—We should take into consideration that some kinds of water can be more safely used for lead pipe than others. Soft water is absolutely dangerous. In Norwich, where many have lingered for years with lead poison, one will be laughed at if he should assert lead pipe is not poisonous.

Dr. J. M. Crowell.—In our profession we are much indebted to lead pipe for giving us many cases of paralysis.

Dr. Isaac P. Trimble.—Printer's colic is a well known disease, still few printers die with it.

### COVER FOR PICKLED MEAT.

Mr. John Burgum, Concord, N. H., exhibited a new cover to keep meat covered with brine. It has three adjustable, galvanized pointed irons, which hold the cover at any point within the barrel, and it seemed quite useful.

### HYDE & CO.'S SORGHUM EVAPORATOR.

The committee on Hyde & Co.'s Sorgo Evaporator, Baltimore, reported favorably, stating that it removes the disagreeable taste; that it will evaporate 100 gallons per day; that it is portable, and that it can be used for maple or beet sirup.

### VARIETIES OF CORN.

Dr. S. J. Parker, Ithaca, N. Y.—It is said that the yellow corn sent as donations to the suffering poor at the South was fed to the pigs. The Northern yellow corn is as digestible as the Southern white varieties. I have eaten both in their best localities North and South. There is grown a coarse, oily yellow corn, for cattle, at the South, that is quite indigestible. But it is false that the common early yellow sorts at the North are in the least inferior for table use to the best Southern white. The white variety is better to the eye—that is all. The Narraganset is a dwarf variety, with green leaves and stalks or cane; very early; the ear quite large for the stalk; just the right size to boil and eat; very sweet and choice. The Olcott is later than the above, red leaves, stalk, and husk; is also a dwarf variety. When fully grown, is large in the kernel, fine-sized ear, quite sweet, but not so much so as the Narraganset. The Onondaga—this is the common variety here in Central New

York—has various names, but as it is said to have been in the early possession of the Onondaga Indians, this is the real name. It is as tall in stalk as the common yellow corn, large in leaf; stalk, and leaf bright green, ear a little longer than the varieties just named, very sweet, tender, and desirable, when pure, but is now much mixed with other kinds. These three kinds are all the sorts worth attention that I know of. The Stowell evergreen, and a host of others, only corrupt these kinds when grown near them; are not to be compared with them in excellence, and the distribution of them has done harm, not good.

Mr. N. C. Meeker.—This last remark is too sweeping. The Stowell evergreen is a most valuable variety in the West and South. One should be on his guard in concluding that what is suited to one locality is suited to all others. The corn raised in New England is of no value for planting in warmer climates and on corn soils.

### WORMS ON STRAWBERRY VINES.

Mr. F. T. Haseltine, Hale's Corners, Wis., states that a worm worked on the leaves of their vines, making the fruit worthless, and he inquires if there is a remedy, and whether burning the mulching in the spring would be a preventive, and not injure the fruit.

Mr. N. C. Meeker.—It will be impossible for the Club to give specific directions in this case, as they have never seen vines so affected. The worms may breed in the mulching; if so, to burn it early in the spring, providing the crowns of the plants are not hurt, would be a remedy. Perhaps next year the worms may disappear. It is not often that any class of insects that injure vegetation stays long. This year the canker-worm disappeared, and in many localities the circulios, which had destroyed peach crops for years, did no damage.

### EXTENSIVE VINEYARD.

Mr. M. B. Bateham, the secretary of the Lake Shore Grape-Growers' Association, informs us that several large capitalists of Dutchess county, N. Y., have recently purchased 1,200 acres of land at Brocton Station, on the Lake Shore railroad, between Dunkirk and Erie, for the purpose of extensive vineyard-planting. They are laying out a village, and contracting for a hotel to be built, and dwellings for a colony of Germans, who are to come from the Rhine districts, to serve as laborers. One hundred acres or more of vineyard are to be planted the coming spring, and additions made each year, as fast as the vines of choice varieties can be produced, and the necessary labor performed. Mr. Requa, the proprietor of the new grape called the Salem, is one of the leaders in the enterprise.

### MANAGEMENT OF MARL.

Mr. S. Edwards Todd.—It is remarkable, as one rides through the country, to observe what wonderful provision has been made for maintaining the fertility of the various kinds of soil in different localities. In South Jersey, for example, where a portion of the soil consists of light sand, there are unbounded deposits of the choicest marl only a few feet below the surface of the ground, and inexhaustible stores of rich muck, and in some instances beds of clay on the surface. With a suitable quantity of each of these materials, every acre of the poorest land in that State can be made to produce root crops of any kind, fruit trees, or even cereal grain, in such quantities as to amply remunerate the proprietor for the labor expended in improving the fertility of the poor land. At Farmingdale, on the Raritan and Delaware Bay Railroad, on the farm of Mr. Samuel Brower, our little company traveled to the marl bed of the proprietor of this farm. The surface of the bed is only a few feet below the tillable land. The earth is stripped from the surface of the marl, so that teams can be driven directly to the marl bed. At this locality the marl was estimated to be from thirty to fifty feet deep, and extending across the entire country. It is a fertilizer of great excellence for producing any kind of roots, cereal grain, or grass. Mr. Brower showed us where he had top-dressed one of his meadows with marl during the past winter. The young grass appeared exceedingly promising. In reply to the interrogation, about how much hay per acre will this meadow yield, he said three tons or more. When a farmer opens a bed of marl on his own land, his fertilizing matter costs him nothing but labor of digging it, which can be performed at almost any season of the year. In some instances marl is dug by a kind of dredging machine, worked by steam, which is capable of loading on board of the dirt cars about one ton of marl per minute. Hundreds of tons are transported to small villages and dropped at any convenient place along the railroad, from whence farmers and gardeners haul it to their fields at any season of the year, although it is far better to apply it in autumn, previous to the season that produces a certain crop which was designed to be benefited by the application of a dressing of this kind of fertilizing material. At Manchester, a smart little village about fifty miles from New York city, where there are about twenty thousand acres of as good unimproved land as the State affords, large quantities of marl are employed, and it is found to be the most efficient and the cheapest fertilizer that can be employed. When Irish potatoes are planted, about one quart of pulverized marl is deposited in every hill, and the result is said to be most satisfactory in the production of fine tubers. Adjourned.

## October 15, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### MUNGER'S PATENT DUMPING WAGON.

The Chair announced that a new dumping wagon was at the door, and he appointed a general committee to go out and examine it and report. This was known as Munger's patent.

The main device consists of rollers on the forward and hind bolsters; hooks hold the wagon bed in place, but when unhooked, and the horse backs, the reach, having a hinge in the middle, rises, the wheels approach each other, and the wagon box is turned up the same as a cart body. When the horse starts up, the wagon returns to a natural position. The committee were decidedly of the opinion that it is a simple and important improvement, useful on any farm. The cost of such an attachment is ten dollars.

### COTTON-WORMS—FLAX MANUFACTURES.

A letter was read from Mrs. Mary F. Trust, of this city, giving an account of the ravages of the cotton-worm in Florida.

The Chair.—If cotton has so many enemies as we hear of, we have an article in the North suitable to making cloth, not subject to such disasters. I hold in my hand a sample of fine towels, made by Whiteside Brothers, at Moodna, Orange county, N.Y. I am informed they are the first articles of the kind made in this country on power looms, and spun by machinery. This is a new enterprise, destined to work great changes. You see the excellent quality of the goods, and the fine finish. I well remember when flax used to sell from seven to eight cents a pound; now it is from twenty to twenty-five cents, with an unlimited demand. It is amazing that farmers do not watch their chances. We must, by no means, lose sight of the flax culture. A powerful inducement to grow it now exists in the fact that flax can be prepared for sale almost wholly by machinery, and at a small cost. I know that any mother would be proud to say that the outfit of her daughter, consisting of sheets, towels and pillow-cases, was the production of her own hands.

Mr. Adrian Bergen.—When cotton was raised so cheap, farmers were obliged to abandon the cultivation of flax, for, with their rude methods of working it, in which no improvements had been made from the time of the Egyptians, they could not stand the competition. I would be glad to see the culture renewed.

Mr. Solon Robinson.—One important thing, which is not often mentioned, is the superior healthfulness of flax cloth over cotton, either for clothing or bedding. There is not a particle of doubt of this. Whether people know it or not, the time is approaching, and rapidly too, when cotton cannot be produced in anything like the abundance it has been. Its cultivation has impoverished more acres, and more farmers, than all the other crops combined. Travel, as I have, through the South, and you will be convinced how great the destruction of the soil has been. Our people must return to the cultivation of flax.

Mr. P. T. Quinn.—Southern soil has been exhausted by reason of shallow plowing. The same cause would produce the same result in the North. More light is needed among Southern farmers.

Mr. N. C. Meeker.—I have visited the salesroom of Messrs. Whitesides, No. 189 Church street, in this city, and learn that they have the only linen works in this country; that they learned the business in Ireland; imported their machinery from Belfast, costing $80,000; that they employ from one hundred to two hundred hands; that they have been obliged to experiment some, and hope to find the business profitable, but there are difficulties. Among these, they have to compete with cheap foreign labor, while they have a protection of only thirty-five to forty per cent, while wool and woolens have from seventy to one hundred and twenty, and silk sixty per cent. Then some persons have a prejudice against a home-made article, and think nothing can equal the imported, and sometimes, to make sales, prices are reduced. And yet the quality, generally, is equal to the imported, while some linens are decidedly superior, even at the same price. They make all kinds, such as diapers, ducks, drills, huckabacks. and yarns, taking the material scutched from the farmer. Twenty cents a pound is as cheap as it is in Ireland, and in this they are on a level. The spinning is done through hot water, and all the various processes correspond to the manufacture of cotton, but the machinery must be more expensive, because flax is not elastic. Their supply of flax almost wholly comes from Orange, Rensselaer and Washington counties, New York. Large quantities have been raised in Illinois, this year, and the quality is represented superior to Eastern flax. None has yet appeared in this market, and it may prove not to have been properly handled, but this is a matter easy to remedy next year. With these facts before us, it does seem as though Western farmers, and all others, have a new prospect opened for raising a most profitable crop. In respect to the patriotism of the effort, there can be no question. The Messrs. Whitesides are entitled to the thanks of the country for the efforts they are making. At the great fair of the American Institute one will see specimens of all their goods, and their fine machinery in constant operation.

### HAND GLASS FOR MELONS AND CUCUMBERS.

Mr. G. J. St. John, Stamford, Conn., exhibited several hand glasses. They are composed of two large lights of glass, in the form of the roof of a house, with cloth for the gables. The members thought favorable of the invention.

### STREET-CAR HEATER.

Mr. John Gibson, Albany, N. Y., exhibited an apparatus for heating street cars. This contains a furnace with a cover, with regulators and dampers, and all this and the pipe pass under the seat, up through the roof in the forward end. This is not exactly new, for it has been in use in several cities where the public insist on being comfortable, and there can be no doubt of its utility. In this city, many walk in cold weather, because the cars have no fire.

### WHIP HOLDER.

Mr. J. Gibson, Albany, N. Y., exhibited an improved whip holder. The whip is to be made hollow in the handle; the holder is a tapering stem of malleable iron, having a base to be attached to a carriage or sleigh. The ornamental part of the whip, consequently, is placed so that every body can see it.

### MEASURING FAUCET.

Messrs. Peck & Seymour, 299 Pearl street, New York, exhibited a measuring faucet for drawing molasses and heavy oils. The construction is such that, by turning a crank, the fluid is forced out by a certain number of revolutions of the crank, and meanwhile said revolutions are indicated on a disk in fractions and whole numbers; hence no measure is necessary, and customers will be waited on with dispatch, and without being defrauded. A committee was appointed to examine it.

### IMPROVED CARRIAGE AND CAR WHEEL.

Mr. John Raddin, Lynn, Mass., exhibited an improved carriage and wheel. This wheel is elastic, for an elastic washer, or cushion, is introduced into the hub, bearing against the axle, preventing shocks or strains. The spokes have screws at each end, so that by turning them, the felloe may be expanded, and the tire tightened. In a car wheel, the hub is made separate from the web, so as to be replaced at a small expense. A ring of rubber surrounds the hub, between the web and hub, and there is a packing of rubber between the flange and hub, which, with other details, give ease of motion, and relieve the wheels from sharp concussions. The inventor stated that these wheels are used on the Eastern railroad, and on the steam fire engines in Boston.

### EXPERIMENTS WITH POTATOES.

Mr. W. S. Lunt, Fostoria, Seneca county, Ohio, communicates to the Club the following experiments with potatoes. Yield of potatoes planted 19th day of April in single eyes, in drills, on the same day, and received the same treatment: Goodrich Early, one pound seed gave fifteen pounds product; or, allowing twelve bushels seed per acre, the product would be 186 bushels per acre. Pinkeye Rusty Coat, one pound yields seventeen and a half pounds, or 210 per acre. Flukes, one pound seed gave nineteen pounds, or 228 bushels per acre. Garnet Chili, one pound seed yields twenty-one pounds, or 252 bushels per acre. Cuzco, one pound gave forty-one pounds, or 486 per acre. Harrison, planted a few days later, and on better soil, gave at the rate of 450 bushels per acre, while the quality is far superior to the Cuzco. These results are obtained in one of the dryest seasons known for twenty years. Thus far no rot appears in any of these kinds.

Mr. Edwards Hicks, North Hempstead, L. I.—I have heard farmers say, "I rather think large potatoes will yield the most," and have read experiments which proved that large seed did give a little the best yield, which has induced me to make experiments with the view of finding what size and preparation of seed is the most profitable to plant, rather than to ascertain which gives the greatest yield.

The experiments were made with the greatest care, the rows were in the middle of the patch and each received an equal amount of manure and culture. They were dug when fully ripe and accurately measured. The rows were of equal length and each was planted with 460 potatoes or sets. Estimating the cost at one dollar per bushel for large potatoes, and fifty cents per bushel for small potatoes, the seed for the first row, small potatoes, from one and a quarter to two inches in diameter, cost fifty cents, which yielded ten dollars and seventeen cents.

Second row—large potatoes, two to three and a half inches in diameter, seed cost two dollars, yield eleven dollars and seventy cents.

Third row—large potatoes, with all the eyes cut out but the main one; cost of seed and cutting out of eyes, two dollars and sixty cents, yield eleven dollars and sixty-three cents.

Fourth row—planted with quarters of large potatoes; cost of seed and cutting, fifty-five cents, yield ten dollars and fifty-one cents.

Below is a table showing the profit of each row, all things being equal but cost of seed.

| Rows. | Cost seed. | Yield. | Gain. |
|---|---|---|---|
| 1st | $0 50 | $10 17 | $9 67 |
| 2d | 2 00 | 11 70 | 9 70 |
| 3d | 2 60 | 11 63 | 9 03 |
| 4th | 55 | 10 51 | 9 96 |

From the above table, we find almost no difference in profit between planting small or large potatoes whole; the extra yield does not compensate for the extra trouble in planting large seed. Cutting out the eyes, except one, is labor lost—it takes about four hours to cut out the eyes of a barrel of large potatoes.

I made similar experiments last year, and thought cutting out the eyes paid, but I was not careful enough in planting or measuring, did not know the cost of cutting, &c., so I did not feel warranted in deciding. The fourth row, planted with quarters, required only one-fourth as many whole ones (half a bushel), which was very soon cut, and they yielded twenty-six cents more profit than any other row. As repeatedly planting small potatoes tends to degenerate the crop, large potatoes should be planted, and since cutting them into quarters or pieces gives a profit of twenty-six cents to every half bushel planted, which would amount to several dollars in a large patch, it is evident that planting large and perhaps medium-size potatoes cut into three, four or five pieces, is the most profitable size and preparation of potatoes for planting.

Mr. C. Taber, Brooklyn, L. I., planted four rows of Garnet Chili potatoes in his garden last spring, one with single eyes, one with two eyes on one piece; another with half a medium potato, and the fourth with a whole potato of average size. The variety was Garnet Chili, and the rows forty feet long, hills eighteen inches apart, all manured and treated precisely alike. They did poorly in common with other potatoes on Long Island, the season being too wet. Rot was quite prevalent, all being affected alike. They were dug about the first of November, and it would puzzle one to distinguish any difference in size. The yield was as follows: One eye, twenty-two and three-quarter pounds; two eyes, twenty-eight and three quarter pounds; half a potato, twenty-nine and a quarter pounds; whole potato, twenty-six and a half pounds. This single experiment shows that taking cost of seed into account, a piece of potato with two eyes is the best size to plant.

### WHEAT IN WESTCHESTER COUNTY.

Mr. Samuel Sinclair, Croton Landing, N. Y.—Capt. D. Farrington, of Croton, Hudson River, raised this season one hundred and fifty and a half bushels winter wheat on five and a half acres. He applied one and three-quarter tons bone dust, and the grain was sown on 16th October.

Mr. N. C. Meeker.—Any man should be both respected and honored who will raise wheat in this way in the old States, and show the people that they need not depend on the West for bread.

Adjourned.

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## October 22, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### LEAVES FOR MANURE.

Mr. S. J. Harrell, Preston, Webster county, Ga., writes that he is about to enter into the manure-making business, and thinks of hauling leaves and fine straw into pens, sprinkling through the layers lime, which costs from two dollars and fifty cents to three dollars a barrel. He asks the opinion of the Club.

Mr. Wm. Lawton.—The lime would add nothing to the fertility of the leaves; in fact, they would be better without. Leaves of themselves are excellent. Various other refuse matters are useful in the same way, as they furnish minute fertilizers needed by the plants.

Dr. Wm. B. Peck.—The cost of the lime would be a great objection. The use of lime ought to be better understood. It is believed that its benefit on old soil lies in setting the ammonia free, which otherwise would be held fast. If this is the case, lime would be injurious in a barn-yard.

Mr. Thomas Cavanach.—I use a great many leaves for manure. I place them in a large heap and wet them; this soon sets them heating; turn them over once a week, they soon become rotted. Florists cannot do without leaf-mould.

### PEAT IN IOWA.

Mr. J. V. Mumford, Mason city, Iowa, sent a specimen of natural and pressed peat, showing that they are enabled by machinery to utilize their peat bogs, and get a cheap and good fuel on these prairies, which once were supposed uninhabitable for want of fuel.

### INQUIRING ABOUT MUCK.

Mr. A. P. Sharp, Rock Hall, Kent county, Md., sent samples of turf to learn its value as a manure, and if it would pay to haul it to the barnyard to be composted with manure. They have large quanties of it in that county.

Mr. P. T. Quinn.—We have immense amounts of this turf near Newark, N. J., and we have used it advantageously. All plants appropriate some portion of lime, and yet lime corrodes. If the turf is hauled out in the summer, and ninety loads are mixed with ten loads of manure, to which lime is added, a most valuable fertilizer is obtained. By no other means, or so cheaply, can a farm be made rich as by this process, for it supplies the very elements which have been washed away by rains, and removed by cropping.

Prof. Nash.—I agree to this. This compost is exceedingly valuable, and the muck adds many times to the value of common manure.

Dr. J. E. Snodgrass.—Mr. Sharp, who makes the inquiry, was a druggist, but becoming a farmer, he is doing great good. He is in favor of all enterprises, and he wishes to develop the resources of Maryland.

### SPANISH CHESTNUTS.

Dr. Isaac P. Trimble showed specimens of this fruit, brought from Philadelphia, growing to a large size.

Mr. Wm. Lawton.—Once I planted this variety in pots, transplanted them the next year, and in five years they bore fruit. It is too much neglected.

Dr. Adrian Bergen, of Long Island.—My experience is that this variety degenerates in the third generation, though the first does not. One member remarked that in Europe they are always grafted.

Mr. Williams showed some apples brought from Northern Indiana, that the members might see how we once used to raise fruit here. All through those parts of the West he had visited, the orchards were loaded. Thus, it seems, westward the star of apples wends its way.

### MEASURING FAUCET.

The committee reported that they had seen this faucet in use at several of the best groceries in the city, and, from the testimony of those using it, as well as from what they saw, are convinced that it is a practical and useful invention. By its use, a gallon of molasses may be drawn and accurately measured without the use of a measure or funnel, and in less time than is required to put up a pound of sugar.

### ALARM COFFEE BOILER.

Mr. E. K. Sargent, Boonton, N. J., exhibited his alarm coffee boiler. This has three apartments; one for hot water in the bottom, one above for the coffee, and one above this for cold water and to act as the condenser of the aroma. When the steam is gathered sufficient to make the coffee, it escapes and gives a loud whistle, signifying that it is done. The boiler is cheap and looked effective.

Dr. Peck suggested that a similar contrivance would be useful to tell when eggs are cooked enough.

### CORN SHELLER.

Mr. L. T. Newell, Geneva, Ohio, exhibited one of his corn shellers. This has a small-toothed concave surface, which is turned by a crank running into a concave plate, adjustable by a piece of stout rubber. On a trial, corn was shelled rapidly and well. Price five dollars.

### NAIAD WATER-PROOF OIL FOR LEATHER.

W. K. Wyckoff & Co., Ripon, Wis., exhibited specimens of the naiad water-proof oil. It is recommended for making leather tough, pliable, and preventing shrinking and stretching, and attacks of vermin.

Dr. J. C. V. Smith.—I think this an important matter. I should like an oil that will prevent water from soaking through boots, but I have never yet seen any.

### HOME EMPLOYMENT.

Mr. W. Winestead, Defiance, Ohio.—Before I bought a farm, I was a carpenter, and, having a chest of good tools, I let my boys, as they grew up, have the use of them, taking care to caution them, and if they broke anything I made them pay for it out of their own money. My experience is that it was a good plan, for it kept them out of mischief; and when, at last, I was able to build a new house, the two oldest could do many kinds of work well; the youngest could help a good deal, and in finishing off, they worked at odd spells to make cupboards and presses, which my wife likes better than any other part of the house. So I say, let the boys have tools.

Mr. N. C. Meeker.—Farmers neglect this matter altogether too much. If they are poor, they can buy a few tools at a time. Let the family use less tea and coffee, and fewer fine clothes. Butter and eggs will buy common tools at any good country store. Merchants should consult the interests of their customers by bringing on tools. They should consult with the very best mechanics as to what kinds they should get, for wholesale merchants are on the look-out to work off old-fashioned augers, screws, poor saws, hammers, plane-bits, and the like. A handsaw worth three dollars is cheaper than one worth only one dollar. Auger-bits should not cost less than twenty cents a quarter. The difference between poor tools and none is not great. There should be a good shop, either lathed and plastered or ceiled, so that in cold, stormy weather it will be comfortable, and for want of such many days will be lost. It is the poorest kind of economy to have a shop which leaks, or into which the storms beat. Good tools will not long remain so if they get wet. There should be a tool chest to lock everything in first; more to prevent the young fry from cutting their fingers, than to prevent mother from lending to a neighbor, for it is cruel to refuse to lend, or to make remarks about folks getting the grindstone one-sided.

A turning lathe will be useful, and the boys can make many articles of furniture; but to get models, and pick up ideas, if they are scarce at home, they should visit the best shops in town. There is great need for a common-sense book of drawings and neat designs of household furniture generally, including working models. It is a poor plan to work away blindly. It is better to stop and consider for days, than to work without fixed and correct ideas. Many mechanics are defective in this respect.

### BUTTER-MAKING—FEEDING TURNIPS AND CABBAGE.

Mr. F. Copeland, West Dedham, Mass.—I have fed turnips to cows for several years, as also cabbage, and made butter all the while, and will challenge the most fastidious to detect any flavor of them in the butter. Such food, fed to cows in moderate quantities, just before or immediately after milking, imparts no unpleasant flavor to the milk or butter. It is in overfeeding, or at unseasonable hours, that causes the trouble. I consider cabbage one of the very best kinds of green food for cows. I allow my milk to stand forty-eight hours, and find no ill effects from the milk becoming thick. Again, just as good butter can be made from a churning that produces butter in from five to ten minutes, as by grinding it out in fifty minutes, and often much better. I like the idea as to the quantity of butter a good cow should produce. It will tend to call our farmers' attention to the improvement of their dairy stock. I know men in this section who do not believe that a cow will produce sixteen quarts of milk per day, and hoot at the idea of Jersey and Holstein cows giving from twenty to thirty quarts. I know that our worn-out New England pastures will not produce the rich and nutritious food of your more favored New York grazing lands; still, poor as they are, I have a cow, taken when a day old and raised by hand, by myself, seven-eighths Jersey, that calved May 10th, and gave, for two months, twenty-two quarts per day, and for the most of that time made sixteen pounds of butter a week. She now makes from seven to eight pounds a week. That washing butter in water is injurious, is not an exploded idea. My experience teaches me that it takes from the butter much of the aroma and fine, delicate flavor belonging to a strictly prime article of table butter.

### FEEDING BEES TO PROMOTE BREEDING.

Mr. F. T. Bingham, Gowanda, Cattaraugus county, N. Y., who has had much successful experience in the management of honey bees, was invited to address the Farmers' Club on the subject of bee culture, and to explain the principles upon which his hive is conducted. He stated that he now has about seventy skips of honey bees, and the numerous boxes of superior honey which were sent to New York from his apiary (which the Club were invited to see), convinced every member that making honey, when bees are properly managed, is a paying business, requiring very little capital. The hive, full of bees and honey, which Mr. Bingham exhibited to the committee of the Club, embraces the principle of the old straw beehive. Any farmer who can saw off a board to a line, and drive a nail true, can make one of his style of hives, of rough boards, in a short time. The outer covering of the hive consists of a box made of rough boards, which is open at the bottom, and is placed over that portion of the hive which contains the bees and the honey. Every comb is held in a separate, triangular frame, so that every cell in the interior of the hive can be readily examined, and the comb returned to its place. And if it is desirable to take a few pounds of honey from the hive, one of the triangular frames can be removed, the honey taken out, and the frame returned. This hive has been constructed with reference, also, to convenience and efficiency in affording protection to bees during cold weather. A spacious chamber is provided on every side of the bees, except the bottom, to be filled with cut straw, hay, shavings, or some non-conductor of heat. Apiarians have always experienced serious difficulty in keeping their bees alive during cold weather. Undue exposure in our cold climate operates as unfavorably on bees as on domestic fowls. Those birds that are poorly fed and not protected by comfortable apartments, will never be prolific. The same is true of bees. Mr. Bingham's remarks were as follows:

"While bees in almost any place will gather honey for their own use they will not store sufficient to afford their keeper any real remuneration unless there is a good supply of early foliage within the radius of two miles. If this early supply is not at hand there is no alternative except the daily feeding of every stock from the beginning of May till the clover or other supply comes forward. In the older portion of the country, the greater part of the clover season is lost for want of laborers to gather the honey it contains. When the country was new, early and constant forage was the rule; but as grass and grain took the place of early plants and trees, the early bee pasture failed and with it bee-keeping with its former care. Experience has shown a virgin soil to be the only one on which slothful husbandry will pay. The same is true of bee-keeping. In most of the States, particularly in grazing portions of the country, if bees were fed a little sugar and water, melted together, for about seven weeks previous to the blossoming of white clover, an immense yield of beautiful honey would be obtained. Old bees are of little importance in the work of the hive. The only hope is in the rising generation. To secure a large yield of honey it is necessary to have the hive full of young bees, and the combs full of food, when the clover season or other main supply begins. To do this, if the flowers do not furnish a steady supply of honey and pollen in the early part of the season, recourse must be had to regular feeding, with a view to stimulate breeding. In feeding bees, no honey should be used without boiling and skimming thoroughly, if there is the possibility of its being sour or having come from diseased stocks. No honey is suitable for wintering bees in a cold climate except honey gathered in a similar latitude. A thin sirup made of Muscovado sugar and water, boiled and cleansed thoroughly, makes an excellent feed to encourage breeding in the early part of the season, when the bees fly nearly every day; but it should not be used in the winter, as such feed would be likely to produce dysentery if the bees were confined to their hives any considerable length of time. A convenient method of feeding to promote breeding is, to place a piece of empty comb near some one of the lower holes on the side of the hive—if my hive is used—(the chamber of any other would answer the same purpose,) filling a part of the cells with thin honey or the sirup before spoken of, and a part with rye flour. The bees will use some of the flour for bee bread, if no other is at hand; and it will answer the purpose very well. As the honey or sirup should not be stored to any extent in the hive, not more than two ounces should be given daily, and if the colony is small, less should be used. Feeding to promote breeding is based on the fact that so long as the bees are excited by daily employment in gathering or moving honey, the queen lays rapidly, while on the contrary, if they are idle, she lays moderately, or ceases entirely until a supply of honey can be obtained, which may be too late for all practical purposes, and so far as gathering honey from clover is concerned, bees might as well never be hatched as to hatch from eggs lain while it is in bloom. The bees that gather clover honey must be matured from eggs lain a month previous to its blossoming. This fact will show the importance of early and constant forage, or daily feeding in case the feed should fail for a short time, between apple blossoms and clover. In feeding, only a small opening to the honey should be allowed, as upward ventilation is to be avoided in the breeding season, and at all seasons, unless the hives become damp and frosty. In this hive as in the old fashioned straw hive, no dampness or frost occurs, and no upward ventilation is ever required."

Adjourned.

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## October 29, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### A CHECK TO THE INSECTS INJURIOUS TO ANIMAL AND VEGETABLE LIFE.

Mr. Thomas Affleck, Brenham, Texas.—A citizen of the great pastoral State of Texas begs leave to call the attention of the Farmers' Club to experience and results gained by the writer during investigations in Europe and experiments at home, in search of a means to cure scab in sheep.

The pest was introduced a few years ago by some one who brought bucks or tups into the State for sale. And it has since, and during the war, spread with a rapidity, and to an extent that has become alarming.

I made it my business when in Europe, during the two several periods of the past two years, to look into the means used for the cure of this pest, foot rot, lice, &c.; and into the why and because of sheep farming proving, in Great Britain, the most profitable of all agricultural pursuits, whilst here, north, south, east and west, the general success was at least extremely doubtful.

I was met by the same reply everywhere—"You do not, persistently and systematically, not only clean your sheep from vermin, but protect them from their renewed attacks."

This used to be done there by smearing with a mixture of pine tar and palm oil, or butter; or by pouring with certain mixtures of spirit of (pine) tar, with oil, &c.; and more lately by dipping in decoctions of tobacco, &c., or compounds of sulphur, arsenic, mercury, &c.

To all of these modes and mixtures there were continued and serious objections.

Smearing was costly, troublesome to apply, and stained the wool badly. Pouring did tolerably well, but was open to the same objections. Dipping served the purpose; but decoctions of tobacco were excessively sickening to the animals, and especially to lambs, and its effects were short-lived. Sulphur, arsenic, &c., were decidedly objectionable in their effects upon sheep, operators and wool.

It is but a few years since, in the effort to extract from coal tar a substitute for that indispensable medicine, quinine, that the beautiful anniline colors were discovered; and in seeking to perfect these, first carbolic, and then its active principle, cresylic acids were extracted from coal tar.

Very soon the powerful disinfectant, anti-septic and insect-destroying powers of carbolic acid were made known, and a firm in Manchester, of manufacturing chemists, turned the latter quality to an excellent purpose, and made and brought into almost universal use, "McDougall's Sheep Dip."

This, a compound of this acid, formed into a soft soap, was everywhere named to me as the only effective destroyer of the scab and foot rot insects, and complete preventive to their re-attacking the same animals for some months.

I carried a moderate supply to Texas, and there fully tested its value in destroying insect life, and preventing their attacks upon man, animals and plants.

I found, however, that all insects possess a vitality and vigor in all parts of this continent, which they do not in the cooler and moister climate of England, and that a solution of the same strength that proved effective there, merely paralyzed for a time many insects here. For example, in washing dogs to destroy fleas, using the solution of sheep dip, the insects dropped out, apparently dead; but on being left a few minutes in the sun, rallied, and began to hop about. Since then, I have seen used a similar soap, containing, however, cresylic instead of carbolic acid, which possesses all the qualities desired. It is now employed as the active component in many most useful compounds.

To "return to our muttons." A solution of this cresylic sheep dip, of a strength to cost from two to two and a half cents per head of sheep treated of the average size and weight of wool here, is used as a bath or dip. In England and Scotland, I found that lambs were dipped early in the summer, but the bulk of the flock not until later, when the blow fly is expected. This fly deposits her maggots in the wool, during a dark, moist, warm season, which soon penetrate the skin and do great damage, but do not touch sheep which have been dipped in this compound. The sheep are kept in the bath for from one to two minutes.

In the case of scab, the animals are not only dipped, but a little of the undissolved dip is rubbed in wherever the scab shows itself.

Not to detain you too long, I found that in Texas, this article proved death to all insect life, or rendered the locality, as in the case of floors and carpets to fleas; cupboards, &c., washed with it, to roaches, ants, &c.; colts and calves, to woodticks; the chicken house and nests, to the louse; bedsteads to bedbugs; the cotton plant, on which a solution was sprinkled with a common watering pot, and upon which plants thus treated, not another egg was laid, to the cotton moth; and above all, I never had occasion to make a second application to an animal attacked by that cruel pest of our flocks, the screw worm.

That no animal, and especially sheep, swine and young stock of all kinds, will thrive or fatten, or even breed freely, when infested or troubled at all by vermin, is a fact known to every farmer.

I found that in Great Britain, pigs pent up to fatten, and indeed all swine, were frequently washed with this soap, to prevent the louse. Cows in dairies, horses in stables, dogs both in kennels and at large, were washed with it, as often as might be necessary to keep off the flies, for no fly will alight upon anything, living or dead, that is thus treated. In this climate, in summer, it may be well to let the lather dry on, in the case of dairy cows, &c.

To foot rot, this cresylic acid, used in the shape of an ointment, is an infallible cure, and the value of the discovery is enhanced beyond computation, by the fact that the effect of the application continues for a considerable length of time. I have no idea that sheep, for example, dipped or poured before being guarded or housed for the winter, would need a second application until shearing time.

I found its healing effects upon all sores, from the most offensively gangrenous to a fresh cut, to be really wonderful. In Europe there is as much, or more claimed for this acid as an antiseptic, a disinfectant and general purifier, as for its effects on insect and fungus life.

For my part, I have not a doubt from what I have seen, and from my own experiments, that trees and plants syringed with a solution of this cheap compound, would be completely protected from the attacks of insects of nearly all kinds. I have no idea that the fly or midge would ever deposit an egg in a wheat field sprinkled over with a solution of this compound.

Dr. John M. Crowell said that several around this city are making experiments with carbolic acid on the curculio. It can be obtained at the druggists for seventy-five cents per pound, and in large quantities much cheaper.

### GRAPES AT PITTSBURG, PA.

Gen. J. S. Negley.—The exhibition of over fifty hardy varieties of grapes, in the city of New York, during the last days of October, cannot fail to awaken a renewed confidence in the culture of this luscious fruit, whether for pleasure or pecuniary benefit. The rare opportunity thus presented to test comparatively the qualities of the different sorts, so far as this could be ascertained by the taste or appearance, will mature favorable opinions of many varieties; which, however, should be guided by a knowledge of the hardihood and productiveness of the vines. It is of vital importance to the cultivator of the grape, for any purpose, that he should confine his selection to those which are adapted, by a natural affinity, to his soil and climate. The geographical limits of species are broadly defined on the face of nature. Even sub-species and varieties have their region of adaptation as positively defined. This wonderful provision in the organic laws seems unmistakeable, and should not be passed over unheeded in either of the departments of agriculture or horticulture. I have paused to refer to this important influence over the skill and labor of the vintner, that greater value may be attached to the successful results attained with some of the varieties in certain sections of the country, while they fail in others. Further, as some encouragement to the producer of seedlings, and who consistently believe that this favored land is destined to acquire as its first title, "Vineland of the world." Other timely suggestions may be added (I trust without trespassing upon your patience), for the advantage of those who contemplate embarking in vineyard enterprises, that the achievment of success and public renown in grape culture implies a fascination for horticulture—an eminent fitness for this special pursuit. The choice of a location near lines of cheap transportation, a selection of those varieties which appear to be best suited to the locality. This followed by a judicious treatment of the soil and plants, ceaseless energy, profuse expenditure, a stoic perseverance in combating the numerous enemies of the vine, which seem to be ever on the alert to disappoint fond hopes and blight the results of patient toil. To those who are so fortunate as to possess these qualifications, I would advise the cultivation of the grape, as the most pleasing and profitable of any of the favorite branches of horticulture.

I will now hasten to present a brief description of the characteristic merits and defects of a number of the varieties exhibited by Rev. J. Knox, of Pittsburg. These descriptions are intended to portray the habit of the vines as well as the qualities of the fruit.

*Adirondack.*—Growth slow; badly affected with mildew; one of the least promising in both vine and fruit.

*Diana.*—This grape possesses a peculiar aroma; retains its freshness and flavor a long time after being plucked; keeps uninjured in the fruit room for months. The vine is very productive, but is showing a constitutional weakness. It is, however, superior to many of the new sorts.

*Iona.*—Enamored with the pen-pictures of this variety, I anticipated seeing a vine of unusual vigor, with fruit surpassing all the older kinds. In both these essentials I was disappointed. It is very liable to mildew, though of stronger growth than the Delaware; bunches of medium size; ripens late, not uniformly; no better than a prime Catawba.

*Isabella.*—This is another variety which Mr. Knox should muster out of service. It is not equal to the Creveling in flavor, or so productive as the Hartford; ripens later than either.

*To-Kalon.*—Bunch large, loose-shouldered; berries larger than the Catawba. Flavor agreeable when fully ripe, vine productive, suited only to an amateur collection.

*Taylor.*—In growth, bunch and berry closely resembling the Clinton, but not half so good or productive. It is a greenish white—one of the poor whites.

*Logan.*—Moderate grower, but robust; fruit size of the Hartford; earlier; color a sooty black, flavor repulsive.

*Elsinborough.*—Bunch large, loose, with heavy shoulders; berries diminutive; color a bluish purple; flesh crisp, juicy, piquant, delicious, one of the seckels among grapes; suited for a light wine.

*Herbemont.*—Vigorous grower; productive; bunches large, conical and heavy-shouldered; berries small, slightly acid; rich, vinous and aromatic; color, dark violet blue.

*Anna.*—Bunches medium, slightly shouldered; berries large, greenish white, with a delicate tinted bloom; flesh firm, sweet and aromatic; vine a moderate grower; very productive; ripens rather late; one of the best three white grapes.

*Maxatwaney.*—Bunches medium, compact not shouldered; earlier than the Anna; berries tender, without pulp, sweet and juicy; color a light greenish yellow, flushed with amber; scarcely equal to the Rebecca in quality, but a more vigorous grower and worthier of general cultivation.

*Allen's Hybrid.*—A sweet, delicious white grape, liable to mildew, and not sufficiently hardy for exposed situations.

*Cuyhoga.*—Greenish white; worthless.

*Martha.*—Truly a white Concord, fully equal to its parent in hardihood, fruitfulness and vigorous growth; foliage of a deeper green, more enduring; bunch below the Concord in size; berries nearly equal to it; color a transparent, greenish white with a golden tint; skin thin; flesh juicy and sweet, with a little of the aroma of the Concord. It is a superb and highly attractive white grape, one that promises to bestow credit upon the skill and enterprise of its introducer to public favor.

*Ives.*—I am agreeably disappointed in the characteristics of this variety. The fruit is large; earlier than the Concord; juice rich, and, to many, palatable; vine robust, hardy and productive; promises to be a valuable wine grape.

*Union Village.*—Bunch and berry enormously large and attractive; one of the most showy exhibition grapes; flavor second-rate; color black, with a lighter brown.

*Hartford Prolific.*—Hardy, vigorous, early and productive; bunches large and shouldered; berries round, the size of the Catawba; skin thick, black, with a dark bloom; flesh moderately juicy, sweet, with a slight astringency; one of the most easily-grown varieties.

*Catawba.*—Bunches defective; berries scarcely colored; very uncertain with Mr. Knox; last season the fruit was finely developed —surpassing in flavor the fruit from the lakes.

*Clinton.*—Does remarkably well in the West. The fruit attains its greatest excellence, and can be used to advantage in making a light, red wine.

*Concord.*—Its hardiness, luxuriance, productiveness, size, and beauty of bunch and berries, certainly justifies the high commendations given it by Mr. Knox. He has acres of the Concord, finding a market for the abundance of magnificent fruit in all the Eastern cities. Although the suitableness of the Concord for wine has been disputed, it can be made to equal many of the brands of claret which we find in our market. The Concord may be classed as one of the best, if not the very best market grape, where it fully succeeds.

*Alvey.*—Vigorous grower, though not as robust as the Concord; foliage luxuriant and enduring; vine productive; bunches and fruit below medium; larger than the Clinton, which it resembles in color; fruit ripens uniformly in the season of the Concord; flesh juicy, vinous, melting, delicious; when expressed has a beautiful magenta tint. The Alvey has commendable qualities, either for the table or wine; for the latter purpose it will soon become a favorite.

*Delaware.*—Although the Delaware is a slow grower, always more or less affected with mildew, yet, when it yields a crop of perfect fruit, as it has this season, it is the "Little Amber Gem" of the vineyard; deliciously sweet, with a delicate aroma—one of the most attractive in the market—possessing desirable qualities for either the table or wine. The Delaware is deserving of a place wherever it can be grown, even with moderate success.

*Creveling.*—Bunch large, long and loose-shouldered, being above medium; round and black, with a slightly purple bloom; flesh tender, juicy, sweet—much superior to the Isabella. The vine is vigorous, hardy and productive. It, however, loses its value as a market grape, by ripening after the Hartford, and nearly at the same season with the Concord, and lacking beauty of bunch.

*Rogers Hybrids.*—The varieties enumerated are all interesting acquisitions, several possessing very desirable qualities. The vines are exceedingly robust, free from disease, increasing in fruitfulness with age. With few exceptions (which are noted), the bunches are large and open, the berries enormous. Nearly all have thick, tough skins, more or less astringent when compressed; the pulp almost as firm as a plum. The flavor is distinct in all, and quite pleasing in some. The easy adaptitude of these varieties to variable climates and soils, will naturally command for them an increasing interest. I therefore describe several of the numbers, which I would otherwise discard:

No. 1. Bunch large; berries above medium; oblong in form; color bright amber, with a beautiful greenish tinge; skin thin, slightly acid; flesh tender, juicy, vinous, sweet, with a musky aroma; remarkably fruitful, and the nearest approach to a foreign type. This variety should have a warm situation; the crop reduced to induce perfection.

No. 2. Immense bunch and berry; very productive; color a rich purple black; pulp rather firm; slightly acid, with an apple flavor; only second rate.

No. 3. Large loose bunch; large berry; color, light Catawba; flesh tender, sugary and soft when fully matured; flavor musky and sweet; ripens immediately after the Hartford; should produce a light aromatic wine.

No. 4. This variety has an established reputation; the bunches are large and compact: berries above the size of the Concord; ripens before the latter; color, a deep blue-black; pulp tender, sweet and piquant; skin thick; the fruit hangs well; quite productive and profitable.

No. 5. A slow grower; specimens of fruit too few to determine their relative value.

No. 9. Resembles a well-ripened Catawba; pulp tender, sweet and luscious; ripens early; hangs well on the vine, free from imperfect berries, and is very fruitful. I am favorably impressed with this variety, both for dessert and wine.

No. 13. Bunch large and loose; berry large, dark amber; early; flesh sweet, vinous and palatable; the fruit hangs on the vines until dried; has some of the qualities of a wine grape.

No. 14. Fruit large; amber colored; flesh sprightly, tender and pleasant.

No. 15. Large bunch and immense berries; dark amber; skin thick; pulp crisp, sprightly and sweet; a great bearer; one of the most promising.

No. 19. A large black grape, flesh firm like a plum; when very ripe, sweet and good; seems to succeed everywhere.

No. 22. Large bunch; berries very large and showy; skin thick and astringent; flesh firm, sweet and pleasant; color blue with a violet amber tint; now known as Salem.

No. 28. I consider this number one of the best; bunch and berries large and attractive, hangs well to the stem; pulp juicy, piquant and delicious; skin very thin; good for the table or wine.

No. 30. Large loose bunch; large berries; amber color, with a rich bloom; skin thick and tough; flesh tender, sprightly; moderate.

No. 32. Has some of the characteristics of No. 9, but is a sweeter grape; the skin, however, is quite astringent.

No. 33. Bunches and berries, large; purple with black bloom; pulp fine; flavor spicy and pleasant.

No. 34. A superb-looking grape; the largest of the hybrids; color black; skin thin; flesh tender; very productive; entirely too acid.

No. 36. A beautiful, large black grape; the berries covered with a glossy purple bloom; pulp tender, with a spicy, acid flavor; skin thin; productive and vigorous; late in maturing.

No. 39. Medium bunch and berries; flesh firm; skin thick; quality good.

No. 41. Similar to No. 36 in size and productiveness; flavor rather acid, yet, when fully ripe, of a pleasant piquancy.

No. 43. One of the most attractive, with unfortunately a thick, astringent skin; the pulp tender and juicy; may improve.

No. 44. Bunch and berries of medium size; somewhat larger than the Concord; a deep blue-black, with a thick skin and firm flesh; flavor sweet; very pleasant; vigorous, hardy and fruitful; one of the most desirable of the hybrids.

Gen. Negley stated that they grow strawberries between the grape rows, manuring highly, and giving good cultivation; that their location is on a hill 500 feet high, sloping southward and overlooking Pittsburg, and that the soil is common to most of Western Pennsylvania, being over the coal measures. Several boxes of fruit were distributed among the members, and highly relished, particularly the Concords. Many placed it next to the Catawba. But let nobody plant the Catawba except in localities where it is known to succeed.

Dr. J. E. Snodgrass.—If all the grape growers in our country will give us their experience in this manner, stating distinctly the kind of soil, climate, and other peculiarities, those of our people wishing to plant would obtain valuable information.

Mr. L. L. Whitlock.—This is what people want. It will not do for a dealer to send to a distant locality what is successful only with him.

### THE PERIODIC LAW.

Mr. Geo. A. Leakin, Baltimore, Md.—While military chaplain in a hospital, I had opportunities of investigating the phases of mental emotions, and as my observations extended, I was led to suspect the same periodic law as obtains in the world of nature.

This principle, deduced from a number of facts, reflected increased light on the facts themselves; just as the ascending dew, condensed upon the mountains, trickles down the valleys and clarifies the very lake whence it emanated (a cycle for ages unknown); or as the law of gravitation, extended to the planets, revealed a more exact system of longitudes, thus giving increased security to commerce.

Was it then surprising that this law should obtain in the domestic history of families? In the fluctuations of colleges, congregations and political parties? In the circulation of periodicals, in epidemics, and in vast conflagrations? In the transmission of letters and telegrams? The number of passengers, and freightage? In the accidents of travel, marine losses, fisheries, and in the annual yield of fruits and harvests?

I had previously learned, from the writings of M. Quetelet, that choice itself was no antagonist of this law, as applied to mental and moral contagions, and the designed destruction of persons and property.

But that which fixed my attention particularly was your published list of the famines and periods of scarcity in France during the last three centuries, whence you deduce a septennial failure, adding that this law is applicable to other countries, and concluding that this is "plainly owing to some law of nature, yet undiscovered, that these unfruitful seasons recur at comparatively regular periods."

This "undiscovered law" was the very one which engaged my investigations, and I soon found similar facts, viz: "Four drouths in Montgomery county, Md., at intervals of sixteen years; in parts of Illinois, a similar recurrence in seven years; a change in the Delaware peach harvest in twenty years; and in Texas, a general expectation among the old settlers, of abundance every twenty years."

Closely connected with this periodic agricultural law was a field where chance hitherto held sway, viz: meteorology and fluviology; for, if by certain, though partially discovered law, we may predict the coming storm, we may with equal facility anticipate the river flood—a cycle of modified vapor—"the waters above the waters." It is remarkable that while much attention has been given to meteorology, this river law and the agricultural cycles, have been overlooked; and yet the connection between the two is so indissoluble that any fact discovered in the one must elucidate the other. I might further suggest that the septennial fallow of the Jewish law, may have been this very undeveloped periodicity, written ages previously, on the ground itself.

In the report for 1865, page 572, the Agricultural Department at Washington published the above facts, calling the attention of our American farmers to "seasons remarkable for droughts or rain, scanty or abundant harvests, that such facts may be communicated to that department;" adding, that if such law be ascertained, "what a valuable saving of time, labor and crops would result to the farmers and the nation."

The universality of this principal emboldens me to ask of you its publication. We are, in this western continent, continually reminded of your skillful looms and vineclad hills, and we shall be much more indebted for those products of the mind—that "*universal exposition*" which blesses both giver and receiver.

### FLEAS IN ILLINOIS.

Mr. James F. Dunn, Galesburg.—Some of us are annoyed exceedingly with fleas; they live and breed where there are no cats or dogs. Can you give a flea-bitten citizen a remedy?

Mr. Wm. B. Harrison.—The essential oil of pennyroyal, sprinkled on a bed or on clothing, will drive them away. In Louisiana, we used to sprinkle it around the rooms to keep off the musketoes. One should be careful not to get any of it in his eyes.

Mr. Doty.—A few weeks ago, when I was in Louisville, the landlord furnished me with a vial of this to rub on my face, and I found it effectual, though in the middle of the night it was necessary to make another application.

### LIGHTNING RODS.

Mr. Jared Walters, Vineland, Wisconsin.—I would like to learn if there are trustworthy statistics showing the amount of protection bestowed by lightning rods?

The Chairman.—If Mr. Solon Robinson were here he would decidedly tell us these rods are of no manner of use. For my part, I fancy there is security in them, and having five in my house, I sleep during a thunder storm without apprehension, whatever may be the facts in this case.

Mr. Allen.—Last summer, in Ohio, I was shown a two-story brick house which had a lightning rod, down which, one night, the lightning descended part way, went into a bedroom, passed along a bed rail, then crossed the bed, killing a young man. Whether the rod was properly put up, I do not know.

Dr. Israel Jarvis.—One not properly put up is not a lightning rod.

Dr. J. M. Crowell.—A house with trees standing around it, higher than the house, is perfectly protected.

## ACID IN FOOD.

Mr. A. S. Howalson, Pittston, Luzerne county, Pa.—I have read the reports of the Farmers' Club for many years, with a great deal of pleasure. The remarks of the Club, from time to time, on the deleterious nature of rhubarb juice, especially in the form of wine, I think prove it to be hurtful as a beverage. The discussion of this question doubtless has done much good, and more light might be given were the investigation extended to the quality of the acids found in the different kinds of berries, especially those of cranberries and red currants. The demand for the former seems to be greatly on the increase for cooking purposes, and of the latter for cooking and homemade wine. Now, if the acid of these, and of similar small fruits, should, on examination, be found to contain a poisonous substance, hurtful to health, it would be desirable that the reading community should know of it, and at least be advised to a very moderate use of them, especially when used in the form of an essence or extract, such as berry wine; or, when cooked with enormous quantities of hog's lard, in the shape of pies.

Mr. N. C. Meeker.—Pie crust, as often made, is unhealthful. A distinction should be made between the acid of the common small fruits and the oxalic acid of rhubarb. There can be no harm in using currants, gooseberries, strawberries and cranberries, as a general thing, though there may be some constitutions with which they do not agree. In warm climates, acid fruits abound, and are absolutely necessary to health. The pine-apple, lemon and orange, are notable instances. After the juice of fruits is extracted it begins to foment, and, if properly managed, becomes vinegar, which is a permanent state. From the earliest ages, vinegar has been grateful to the human palate, and in moderate quantities it is a healthful tonic. Rhubarb is not a fruit, nor does it partake of any of the healthful qualities of the juice of the vine. In the spring of the year, when fruit it scarce, limited quantities may be used with impunity, but when made into wine and used as a beverage, there is no doubt but it acts on the kidneys in such a manner as to produce gravel, or a distinct disease under the general head of lithiases. They who sell this root as a wine plant should be made subject to criminal prosecution.

## VINEGAR.

Mr. S. J. Woodman, Chicago, Ill.—A barrel or a cask of new sweet cider, buried so as to be well covered with fresh earth, will turn to sharp, clear, delicious vinegar in three or four weeks, as good as ever sought affinity with cabbage, pickles, or table sauce, and better than is possible to make by any other process.

### A NEW WAY TO PICK FRUIT.

Mr. A. P. Johnson, Busti, N. Y.—Take an old blanket, tie up in it as much hay or soft straw as it will hold, place it under or near the tree, have it so adjusted that the apples can be dropped into it, and they will not be bruised in the least. By having it moved occasionally a person can clean a whole tree without getting down, which is quite an advantage when trees are large and tall. Beside, by this plan much fruit may be secured from the tree which could not be picked if cumbered by a bag or basket. Will the Club please state the best time to transplant evergreens? Is there a similarity in the nature and character of all evergreens (as, for instance, the pine and the balsam fir)?

Mr. N. C. Meeker.—From April to June, evergreens can be transplanted, and in the winter also, if a ball of frozen earth is attached to the roots. Evergreens growing in the woods are difficult to transplant unless quite small. It is customary for nurserymen to transplant evergreens on their own grounds at least twice, so that they may get fibrous roots, otherwise they are not fit for sale. The roots never should get dry, nor should the sunlight or air be allowed to reach them.

### LONG ISLAND LANDS.

Dr. E. F. Peck, of Brooklyn, sends a long and interesting account of the Long Island plains, in which these lands are shown to be equal to the very best lands on the Island, when cultivated in the same manner that the old farms are. These lands are valuable for all kinds of crops, and particularly suitable for fruit-growing. Actual cultivation on these lands, at different places along the line of the Long Island railroad, for a distance of more than thirty miles, has fully demonstrated the productive quality of these long neglected lands. Gardens, and fields of grass and grain are now to be found in various places, in the wilderness of Long Island.

### COMBING WOOL.

Mr. T. L. Hart, West Cornwall, Ct., sends a sample of wool from a Cotswold ewe, thirteen inches long, the fleece of which weighed ten pounds, and he inquires the difference between it and the Canada combing wool, selling in Boston for seventy to eighty-five cents a pound?

Mr. N. C. Meeker.—It is the same kind, and a beautiful specimen, too. These sheep are very profitable in small flocks, and many more of them are needed in this country. Adjourned.

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## November 5, 1867.

Prof. SAMUEL D. TILLMAN in the chair; Mr. JOHN W. CHAMBERS, Secretary.

Mr. J. H. Foster, White Horse, Camden county, New Jersey, sent several packages of cuttings of the Kittatinny and Early Wilson blackberries, which were distributed among those who had a place to plant bushes. Several hundred cuttings were received last week from the same source.

Mr. Wm. Lawton said that the object of sending these cuttings was to show to farmers and gardeners how they can procure an abundant supply of bushes at a cheap rate. Heretofore, blackberry bushes have been sold at enormous prices. But plants can be raised from root-cuttings more than ten times cheaper than to purchase them.

Mr. Thomas Cavanach said these cuttings should be deposited in a "cold frame" this fall. Then if bottom heat can be applied next spring, every cutting will grow.

### GAS TAR WALKS.

Mr. A. W. Rhodes, Providence, R. I.—Take dry gravel sifted clean, and work in gas tar cold, with a shovel just sufficient to cover each pebble. Put it in your paths, three inches deep, and roll well with a heavy roller, or pound well by placing a board on the walk and pounding with a heavy stick or beam. If you wish a very smooth surface, mix gas tar with sharp, clean sand or ashes, and spread it on top of the gravel an inch and a quarter thick, roll thoroughly, and finish with a sprinkling of clean sand. Frost will not affect this, providing only just enough tar is used; will be fit for use immediately, and will grow harder every day.

### FLORIDA.

Col. J. H. Goss, of Ocala, Florida, spoke of that section lying west of the St. John's river, from twenty to fifty miles, most of it hummock land, which may be described as black prairie, grown up to timber, which consists of the largest kind of hickory, also oak, sweet gum and white oak, and the surface is undulating, as in Kentucky and Middle Tennessee. I had, on a common farm garden, by the middle of April, without hot-beds, peas, turnips, beets, cabbage, and all the common vegetables. As regards profits, I give a table showing the results of four farmers in my neighborhood, which have been most successful:

| NAMES. | Capital. | Cotton crop. | Other crops. | Gross profits. | Expense. | Net profits. |
|---|---|---|---|---|---|---|
| J. G.......... | $4,000 | $3,600 | $2,100 | $5,700 | $1,420 | $4,280 |
| D. D. Y...... | 6,200 | 7,000 | 2,400 | 9,400 | 3,400 | 6,000 |
| C. ........... | 1,800 | 1,580 | 715 | 2,300 | 350 | 1,950 |
| J. & N....... | 3,600 | 13,800 | 1,800 | 14,600 | 6,200 | 8,400 |

"C." was a small farmer and did all the farm work himself, assisted by his daughters (had no sons), and sold vegetables in town. His expenses were small and yield. All the other places cultivated entirely by freedmen. "J. & N." were Northern men, had never run a cotton farm, and planted it principally. They rented, consequently their capital was smaller in proportion than the others, their expenses greater. They paid higher for labor, and had a school for freedmen. They worked twenty-seven hands. There crops are far above the average, but not better than an industrious, skillful farmer might expect to make with good season. The expenses do not include family expenses or wages of overseer. A skillful farmer will make his family support itself, unless he be rich and aim at style.

The laborers are freedmen, and in my opinion the best free laborers for agriculture in the world. The old planters do not think so, but this opinion was produced by the habits contracted, and the demoralization produced by the slave code. It is the universal testimony of Northern men and liberal Southerners, that they are better than can be procured north. In the counties of Aladma and Marion, where the greater quantities of rich lands lie, and where there are about fifteen thousand freedmen, they can be employed to work from sun till sun, stopping an hour or two for meals, for from five dollars to fifteen dollars a month and rations—one peck of meal and three and a half pounds of bacon. They cook their own rations and never think of coming inside the farmers' houses.

Many think the cultivated grapes would do well. There is a great deal of lime in the soil; the atmosphere is exceedingly humid, and long continued rains prevail in the summer. There are many native grapes that flourish. However this may be, a common stock of cattle, sheep, hogs, goats, and even horses, do well on the common range. The winters being mild, the stock subsist on the common grass, without any other food. With food and attention they would do well.

Land can be had from nothing, under the Homestead bill, to twelve dollars an acre for an improved farm. Eighty acres of United States land can be had for two dollars and ninety cents, by every male over twenty one years old. By an examination of the patents, very good tracts can be sometimes found. The improved lands in the hummock land from five dollars to twelve dollars an acre.

The hummock country, at present, cannot be a gardening or fruit country for market, except near the towns, and they are very far, on account of the delay of transportation. For this reason, the chief articles for sale are rice, cotton and sugar. These crops can be readily transported with such facilities as the country now affords. The Florida railroad runs through the heart of the hummocks of Alachua county; and the Oklawaha river, navigable at all seasons for small boats, runs from the center of Marion. The counties further west have the Gulf ports. With a short line of railroad, the whole country could be put within three days of New York.

Among the rich lands malaria prevails, producing some years all the forms of chill and intermittent fevers. These fevers are light, and yield to medicine. The winters are pleasant and dry, and favorable for lung diseases. The society is rude and uncultivated. The comforts and luxuries of life are few. School and church advantages are greatly inferior to what they are in older settlements. The general hardships and trials of a new country, known only to those who have tried them, may be expected. But this country is now sufficiently settled to have—and does have—the conveniences of grist and saw mills, blacksmith shops and stores, with all manner of supplies.

As to whether Northern men would be safe in going thither, and as to the esteem in which they would be held, Col. Goss said, that he thought they would find every thing agreeable.

## FRUIT-GROWING IN LOUISIANA.

Dr. James O. Noyes, New Orleans, La.—A great many oranges are now raised in Plaquemines parish, Louisiana. The region best adapted to their growth extends from *Port a la Hoche* to Fort Jackson, on both sides of the Mississippi, and is confined to a narrow strip of land perhaps half a mile wide, along the river bank or "coast" as it is there called. Oranges are also produced in the Attokapos region, near Berwick Bay. The entire orange country of Louisiana, does not exceed in extent a couple of counties in New York.

The fruit cannot be produced successfully on the Gulf coast, from Florida to the Mississippi. The same is true of the Western Louisiana and Texas coast. The region along the lower Mississippi is projected like a peninsula into the Gulf of Mexico. Hence, its atmosphere is modified by the breezes from the salt water of the gulf. The same is true of the Attokapos region, the climate of which is also influenced by the adjacent lakes.

Near Fort Jackson, twenty-two different kinds of fruit, many of them tropical, including the orange, banana, mango, fig, lemon, pomegranate, can be produced. Gardens can be cultivated all winter. The cultivation of the orange is, however, most reliable and remunerative. The groves, or orchards, as they are called, extend many miles along the river. There are about a hundred trees to the acre, grown from the seed, and requiring to be neither grafted nor budded. The trees begin to bear when five or six years old; are at the highest point of productiveness in twelve years, and outlive even the hardy apple tree.

The land now occupied by orange groves in Plaquemines parish, formerly belonged mainly to the "poor whites." Those who had sufficient energy to plant a few trees ten years ago, are now surprised to find themselves rich. The fruit is sold, on the tree generally, in February, when the groves are in full blossom. The money is paid in advance. The purchaser, usually a Sicilian or Frenchman, picking the crop and assuming all risks. The fruit can be gathered any time from October to the next May. There are some times two crops on the same tree. The region indicated must have a monopoly of the orange market in the Mississippi valley. In the course of two or three days, oranges can be shipped from New Orleans to any place on the Upper Mississippi, to Chicago, St. Louis, Cincinnati, or any other central point.

Rice is produced in the bed of the orange plantations. It is sown broadcast in March or April, the ground being plowed but once, and the seed put in with a common harrow. The irrigation is effected by digging a sluice through the levee of the river, and regulating the flow of water by means of a gate. The few slight levees and ditches required to prepare the prairie land for rice culture are inexpensive. The water is let on soon after the seed is sown, and is permitted to cover the ground until the rice is well grown. Boys are employed to keep off the swarms of rice birds until the grain is out of the ground. Oxen and not mules are employed in rice culture. The ground is too soft for the latter. By careful drainage, however, the ground can be kept dry enough to be plowed with horses.

I have often seen them raising rice in Louisiana just as I once saw them producing it along the Nile—reaped with a sickle, trodden out on "threshing floors," with mean little creole horses, and the chaff separated from the rough rice by throwing them up into the air on a windy day. When I told them that in the North, all this work would be done by machinery; that a reaper, driven by a lady even, could easily cut from eight to ten acres per day, and a thresher easily thresh five hundred bushels of rough rice in ten hours, both processes with little expense, they looked upon me with incredulity; and when I proposed to a wealthy sugar planter to introduce a reaper and threshing machine for rice culture, he discouraged me, saying that the "poor people" would doubtless drive such an innovator out of the parish, on the ground of his having too much to do with the "evil one."

Mr. Solon Robinson.—I am glad the rice planters there are so far advanced as to use even plows. In South Carolina I saw two hundred acres of rice planted entirely with hoes. At a sale on one of the islands of the effects of a deceased planter, the only agricultural implements were hoes; and there was only one old coach wheel in a shed.

### CALIFORNIA WHEAT AND FLOUR.

Mr. William Lawton.—I have brought a package of the celebrated California wheat, to let the Club see what a beautiful grain is produced in that State. It makes a choice quality of flour, but we have to pay an extortionate price for it. Much of the flour that is brought from California is now offered in half barrel sacks for the accommodation of small families. But it is far better to have the flour made after the wheat arrives here than to purchase the real California flour, as the flour that is shipped at the California ports for New York, during the long voyage on the water, will be more or less damaged by absorbing the noxious odors which are emitted from the filthy holds of the vessels which are laden with flour.

Mr. Solon Robinson.—I have always observed that those flour sacks are in excellent request among dealers in flour. They will always pay a liberal price for them, if those who purchase the flour will return them. The inference is, that the sacks which were branded with a California trade-mark, are again filled with Northern flour, and sold for California flour, at a high price.

Mr. S. Edwards Todd.—I have been accustomed to purchase the California wheat for my own family, after the grain has been run through the smut machine. My boys then grind about a pound or two, as it is needed, in a little hand-mill, like a large coffee-mill. The coarse meal is then soaked in tepid water ten to twelve hours, after which it is boiled for two hours, as we cook rice. This makes a kind of mush, which is served with butter and sugar, or sirup and butter, or cream and sugar, to suit the taste and convenience. We find that wheat cooked in this manner makes a most healthful and agreeable dish. Everybody likes it. There is a great deal of nourishment in it. Such food will supply the waste of the brain, as well as the wear and tear of the body. Besides this, it is a very economical kind of food. But I think the New Jersey wheat is quite as good for this purpose as the California wheat, which costs me ninety cents per peck of fifteen pounds.

## REPORT ON BRINCKERHOFF'S CORN-SHELLER.

The committee on Brinckerhoff's corn-sheller report that, on the 28th of October, they met at the residence of J. H. Macy, of Rye, Westchester county, N. Y., where one man shelled a heaping bushel of ears of corn, just husked, in three minutes and twenty-five seconds, by the watch, in the first trial; and in the second trial, one heaping bushel of dry ears was shelled in three minutes and twenty seconds, one man turning moderately with one hand, and feeding with the other. The ears were the small eight-rowed yellow corn, and the grain was very damp. A bushel of large ears could be shelled in less time than was required to shell the small ears.

The cobs were turned out on one side of the sheller, neatly stripped of every kernel of grain; the chaff passed through the sieve to the floor, and the clean corn, ready for market, was delivered in a half-bushel measure.

The experiment was made with a sheller that Mr. Macy has had in use for nearly a year, similar to the one sent to Paris, and he told the committee that he is perfectly satisfied with its operation. He thinks it is the best corn-sheller that he ever met with, and all the members of the committee coincided with this judgment. The sheller is simple in construction, not at all liable to become deranged by unskilled laborers, and very large ears of corn, and very small ones, whether green or dry, can be shelled without any readjustment of the sheller.

### SUMMER FALLOWS AND WATER PIPE.

Mr. Albert Tompkins, Mount Frisco, Westchester county, N. Y.—I send a few of my notions about farming. I like the old-fashioned way of summer fallowing as being the best way of improving land with the least expense, for then we have ample time to work at it. Land that has never been plowed, and grown to bushes and briars, so that one could hardly get through them, and stony withal, I have subdued in one season—comparatively speaking, have made the wilderness to blossom like a rose. I think the practice of raising buckwheat in this county poor, if one is desirous of improving land, for if summer-fallowed, as it should be, it will soon be good. One not having seen the result of a good summer fallow, can scarcely realize the difference between it and the cropping system. I have never failed of having a good crop of rye in this way, and of grass after it, of course. I sow plenty of grass seed and plaster, while I have seen entire failures by the contrary treatment. Why does not the Club recommend pipe made of common cement for conducting water to farmers' dwellings, as the price of lead pipe is high, for I have known it to answer well, and think of using it myself. It must, of course, be made in the ditch; use a bar of iron similar to a rake handle, turning it while the mortar sets. I have thought that if we could hear more from those comparatively new beginners, who have their farms to improve, hired help, interest money and taxes to pay, it would be as instructive as from those farmers who have a bank to go to.

Mr. N. C. Meeker.—We have seen cement used for water pipes, but unless placed below the reach of frost through the whole course, they burst. The suggestion that farmers with difficulties to overcome have something instructive to impart, is good. That class of farmers have a plenty of ideas, and in their efforts they are certain to get good ones. The truth is, they are our best men, and are laying the foundation for all our future glories.

### PROFITS OF APPLE ORCHARDS.

Mr. E. Densmore, Montclair, N. J.—There is an acre and a half of land fourteen miles south of Erie, Pa., that was planted to apple trees, seventeen years ago, on rising ground, with clay enough to be rich, and gravel enough to be dry, which for six or eight years after planting was cropped, and heavily manured. After that it was seeded to grass, and it has not been touched since, nor have the trees been pruned for twenty years. Fifteen years ago they bore more than four hundred bushels; three years ago they netted four hundred dollars, and for the last five years have netted two hundred dollars a year. This acre and a half is more valuable than any average ten acres in pasture and meadow land, though that is in a region as favorable for grass as any in the world. I know, also, of an orchard of two and a half acres in Crawford county, planted thirty-five years ago, which was cropped twelve or thirteen times; it never had a shovelfull of manure; it has not been plowed for twenty years; during the last six years it has netted two hundred dollars a year, and for twenty years previously it netted one thousand per cent per acre more than adjoining grass lands. I have a friend who is acting on these hints, and who is planting from fifty to one hundred acres of apple orchards in these counties, that is, making the business a speciality; but if he is making a fool of himself, I'll coax him to quit.

Mr. N. C. Meeker.—Mr. Densmore makes these statements to controvert what we said not long ago about "farming with one idea." We entirely agree that an apple orchard, with suitable varieties, will be more profitable than any other kind of fruit, and that a good orchard always is the most profitable part of a farm. Still, for some cause, only a very few get rich with orchards. A fruit-grower is the most visionary man alive; we think we know this to be so, and that a fortune always is just a little ahead. In these days, a man with forty-two faculties ought to do something else beside raise apples, and the children and mother should be able to talk of more than one thing. We object to special pursuits, because they give narrow ideas. Nor is it safe to depend on one crop alone. As a general thing, apples bear only every other year, except that it be on the verge of a large body of water, as on the Lake Erie islands. Perhaps an orchard of twenty acres will be as much as one can attend to. We know of a man who has a peach orchard of one hundred and seventy acres, and though he is an experienced fruit-grower and a good business man, he has been obliged to let it out in ten-acre lots. Of course, peaches require much more care than apples; still, there is a limit to human efforts. In every branch of culture, a man is never certain of constant and profitable help outside his own family. Still, if one has money, let him go ahead with his fifty or one hundred acre orchard. Providence will prosper fruit-growing on a large scale before anything else. The very first culture we hear of was in apples. Man fell from his high estate in an orchard, and the place to seek for a thing is where it was lost.

But this subject did not open by considering men who have made money by speculation or trade, or who have received it as a mark of affection. We referred to the vast majority of men who, so far from having money to plant on a grand scale, will do well if they can get land at all; and we do not like to see them deluded with the idea that if they spend all their time and spare change in some special pursuit, such as fruit-growing, they will get rich. What we recommended was, that such should have a good orchard started as soon as possible; then, that they should raise general crops, wheat, corn, oats, potatoes; have a well-kept garden, and, above all, cows that will give milk.

## IMPROVEMENT ON COG-WHEELS ON CLOTHES WRINGERS.

Dr. Warren Rowell exhibited an improvement he had made in the cogs attached to clothes wringers, whereby the operator is able to pass one of the largest blankets through the machine without throwing the cog-wheels out of gear. When no cog-wheels are employed the lower roller is required to perform much more than its share of the work. This extraordinary amount of pressure and strain on the lower roller soon wears out the rubber and spoils the wringer. But by having such a pair of cog-wheels as are attached to the Universal Wringer, so constructed that the motion of the rollers is regulated by the cog-wheels, the undue pressure is removed from the lower roller, and both rollers wear alike.

Mr. Solon Robinson stated a fact in connection with the manufacture of R. C. Browning's Universal Clothes Wringer, from which farmers, as well as mechanics, may learn a valuable lesson. He said that one of the proprietors told him that when their foreman had finished the pattern of the crank, the proprietors thought it was unnecessarily heavy for the strength required. Therefore, he ordered the pattern reduced to the present size. The amount of iron saved by that trifling reduction of the pattern of the crank was worth $1,000 annually to the company.

The simple fact suggests the eminent importance of understanding the required strength of the materials employed in the construction of every tool and implement, whether it is to be used by farmers or mechanics. A few ounces of iron in a small part of a machine may often be saved, thus reducing the expense of the implement, and at the same time retaining consistent strength.

Adjourned.

## November 12, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary

### PEAR TREES.

Mr. J. F. Stearns, Lowell, Oxford county, Me.—Having set out some pear trees, I wish to know if they should be covered this winter, and, if so, what is the best material?

Mr. P. T. Quinn.—Straw or salt hay will be good. Mr. Quinn then read an article on pear culture, which previously, he had delivered before the Pennsylvania Horticultural Society. He had tried as many as one hundred varieties, but all except five or six had been given up. Of dwarf pears he was forced to confess that he could not make them profitable. The best form is the pyramidal, the lower branches being longer than the next above, while care is taken to thin out the branches so as to give air and light.

### PLASTIC SLATE ROOFING.

For nearly two years past the Club has received constant inquiries on the subject of plastic slate and coal tar for covering buildings, and the accounts have been of such conflicting character that the Club appointed a committee consisting of P. T. Quinn, Newark, N. J.; Isaac Hicks, Westbury, L. I.; William L. Carpenter, S. Edwards Todd and Solon Robinson, New York city, to inquire into and report facts in regard to the value of plastic slate for roofing and other purposes. The committee, individually and collectively, have honestly endeavored for several months past to ascertain the truth, and they made a report through Mr. Quinn, the chairman, to the effect that this kind of roofing is being employed to a large extent, and that it usually succeeds well, and gives excellent satisfaction.

The report alludes to the fact that this kind of roofing is sometimes liable to crack when it is not properly put on; and in some instances, complaint has been made that the effluvia arising from the coal tar with which the flour is mixed, is very disagreeable; and in a few instances complaint was entered against this roofing where the rain water is collected, as the coloring matter in the tar will color the water. The report was accepted, and the committee were discharged.

Mr. Solon Robinson.—Although there have been failures in making roofs of this material, they are all traceable to causes that do not militate in the least against the value of plastic slate, which indisputably does make a perfectly water-tight roof, and what adds to its value, one that is actually fire proof. I have the oldest roof in this vicinity upon part of my house in Westchester county. After more than two years' trial, I do not hesitate to say that I would not exchange it for any other known roofing material. I believe it should, and probably will supersede all other materials. I believe no roof, properly made of this material, ever failed. In addition to what was stated in the report, the committee find that plastic slate is coming into use more rapidly than ever has before almost any other new article or invention. We find recent discoveries and improvements in the use of plastic slate exceedingly promising of benefit to the public. It has been used successfully to stop the tide out of cellars, where everything else had failed. It is now applied to felting, so as to make portable, ready roofing; and sheets of slate have been cheaply constructed, which are better than those from the quarry, because flexible. Experiments are now in progress, which promise a light, cheap felt for roofing paper, fire and water proof. Favorable reports have been made of the use of plastic slate upon the bottoms of ships instead of copper, as well as for protecting posts and building-timbers from decay. It seems only to need time for men to learn how to handle this new material; and that every new invention has been subject to mistakes and failures; but these should not prevent people from enjoying a valuable discovery, and such we believe this to be, and recommend it accordingly.

Mr. S. Edwards Todd.—There are a few points not alluded to by the other members of the committee, which I will elucidate. As we desire to treat everything with the greatest possible fairness, we want to give the plastic slate roofing the full benefit of all its advantages. Hearing of so many failures, I have been exceedingly shy of this roofing, until I gave the subject a full and thorough investigation. I have examined numerous roofs, and my doubts are now all removed. I believe that if the tar and the flour are united in proper proportions, a roof can be made as perfect and smooth as a schoolboy's slate. In my investigations, I have found that the law of definite proportions must be observed when mixing the tar and the flour. Tar two years old is much better than tho tar just from the gas works. Tar improves by age. The proportions should be different, according as the tar is old or new. If a little too much tar be used, or not quite enough, the roof will not solidify so satisfactorily as it will when the tar and flour are mingled in definite proportions. Another consideration which this roofing may have the benefit of is this: I have found that numerous roofs have been made of coal tar, sand and gravel, and they have given wonderful dissatisfaction; and the failure, denunciation and dissatisfaction have all been heaped upon plastic slate roofs, when there had been no flour of slate employed. I have in my mind numerous instances where people condemned plastic slate roofs, after having attempted to make a satisfactory roof of coal tar and sand. Coal tar and sand are very different materials from coal tar and flour of slate. There is another point that I may state for the benefit of this roofing, touching its liability to color the water that is collected on it. I have seen many beautiful roofs in this city made of this material. I was on one very large building covered with this plastic slate, the roof of which was and is now as smooth and free from cracks as one unbroken flagstone. When we were examining the roof on a large house, I observed the water standing in the eave-trough, and it appeared as clear as the water flowing from a mountain spring. Previous to my investigations, I would not recommend this roofing to any one. But now, I believe that, if correctly put on, the roofing will be as durable as time; and after the material has solidified, I do not think it will affect the rain water any more than a roof made of the natural Vermont slate, which is quarried out of the slate beds.

Mr. J. M. Allen stated that there have been failures in making plastic slate roofs; but such failures were attributable to a poor quantity of tar, or to want of skill in mingling the tar and slate flour in proper proportions.

Mr. N. C. Meeker.—My brother has employed plastic slate roofing to a limited extent, and he thinks it requires much skill to put it on correctly. Still, he considers it, on the whole, a valuable roofing material.

Mr. Wm. Lawton spoke at some length on the superior advantages of shingles over all other materials for roofing.

The Chairman stated that he had been unsuccessful in his efforts to make plastic slate roof. But he has so much confidence in that material that he would make another effort. He expressed a desire that the report of the committee should satisfy all inquirers about plastic slate roofing, as its merits and demerits had been fairly presented.

### CLOTHES FRAME.

Mr. J. R. Tewksbury, 31 Dey street, New York, exhibited a new style of clothes frame, which is secured to the side of the room, where the bars can be folded out of the way, or the arms may be extended at pleasure; occupying a depth of less than two inches; which opens in ten fingers, equal to thirty feet of line. It is also used as a clothes horse. It was considered a very ingenious and highly useful device for holding clothes after they have been ironed or put through the mangel. It was approved of by the Club.

### BROWN'S WASHING MACHINE.

Mr. O. Long, Tom's River, exhibited one of Brown's washing machines. It operates like a fulling-mill.

### TRANSPLANTING FOREST TREES.

Mr. Jno. L. Coulson, Natchez, Miss.—I also notice some remarks on the subject of transplanting trees. In the month of January, 1847, I planted fifty-one water-oaks in my yard; forty-seven grew finely; just measured seventeen of them as they stand in the row; they girth, on the average, fifty-three inches. I dug the holes four feet square, two feet deep; I went to the woods and dug up trees about eight or ten feet high, about the size of an ordinary man's wrist. I took up no earth with them; I trimmed the roots off to about twelve to eighteen inches; I cut off every branch to about six inches, but was careful not to cut or touch the center or pointer, which, in my judgment, should always be left, if you want a handsomer tree or quick growth. I filled in the hole with the earth dug out, and I put it in as firm as before it was spaded out, and had the ground moistened around the roots, packing closely, and finished by filling in with dry earth. The next year I planted one hundred and sixty-seven in the same way; one hundred and thirty-one lived. The rule is, to cut off the branches to within six inches of the body, to correspond with shortened roots, while the earth next the roots should be made into mortar, and the air kept out. I think all roads should be lined with trees.

### SULKY AND OTHER PLOWS.

Mr. J. Erving, Goodletsville, Tenn.—I should like to know of a sulky-plow which will plow as deep as a common one-horse plow in common ground.

Mr. N. C. Meeker.—I will say that the sulky plow referred to is not a breaking plow, though it is sometimes used in corn stubble in the spring, when the ground is wet, either for corn, or oats, or spring wheat; it is used mostly in cultivating corn, and of these there are several kinds. On light, well prepared soil, Stafford's is the best, the Hawkeye, Furst & Bradley's and others, are used on lumpy ground. The gang plow is used for breaking, but has not come into general use; and neither kind could be used with much advantage where there are stumps. They are prairie implements. The double shovel cultivator is very good, anywhere. A great variety of plows, and different methods of plowing, prevail in the North according to the soil, some of which would not answer at the South. A heavy cast iron plow, with a point that is replaced when worn out, and a coulter, is used for heavy clay and to turn sod. There is no sod to speak of in the South, and such plows would be useless. Some plows, such as the Michigan subsoil, require more team than a Southern man could spare. In Illinois they make cast steel plows, which go deep, and in the South, with a strong double team, would do very good work. A good blacksmith in some parts of the South will make a one-horse steel plow, which is superior to one-horse plows made at the North. Immense numbers of one-horse plows are shipped from this city to the Gulf States, the West India Islands, and South America, which are probably the meanest plows made anywhere. They are of cast-iron, rough, and short geared, and only sell because no better can be had. They belong to the slave labor system. That light Southern soil wants a long, well shaped steel plow, to be kept bright and sharp, and constructed so as to whirl and pulverize the soil, not to invert it, Muck is a deposit of vegetable matter, generally of considerable depth; it can be found in Southern swamps in abundance, and is worth more than any other, except stable manure. A good deal is sometimes said on deep plowing that might as well not be said. There are thousands of Southern fields so worn, red and dusty, that deep plowing will not add a kernel of corn to the acre. The best use for deep plowing in the South is when the soil is good, so as to prevent the surface from washing away in heavy rains. Such is the case with many fields at the North, when the hard pan comes near the surface. It is loamy and clay lands which are benefited by deep plowing, and, in particular, grass lands. When a hard pan is near it is to be brought up by degrees. What much of the South wants are fields of grass and clover, which are to be obtained by using muck and manures. First, have something to plow, then go deep. There is no good work on farming in the South, and that is what is the matter. Nor is there any for the North, as a whole, that will do to tie to. A man must use judgment, study his soil, experiment, and believe only a small part of what people may tell him.

### LARGE EARS OF CORN.

Mr. J. H. Coffin, Franklinville, Gloucester county, N. J., sent a lot of Indian corn to the Club, the ears of which were twice the size of the ears of ordinary corn. It was the twenty-rowed dent variety, which is exceedingly prolific, and very nice.

Mr. N. C. Meeker.—I think that is the most remarkable corn in the world. I was through that section of New Jersey, where this corn grew, in August, and it appeared there as if there would not be a quarter of a crop. Such ears as these surprise me.

Dr. Trimble.—I have traveled all through Illinois, and I saw no such corn in all my journey through that famous grain-producing State. The land where this large corn grew was worth twenty dollars per acre.

### PRESERVED FRUITS.

Mr. Wm. S. Carpenter showed some pears in prime condition, preserved in a fruit house in which he has an interest. But the most remarkable fruit was peaches in a perfect state of preservation. Prof. Nyce, the originator of these houses, had stated before the Club, that, owing to the thin skin of the peach it could not be kept. It remains to be seen whether these specimens were saved accidentally, or by a new process which can become general.

Adjourned.

## November 19, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### SOWING PLASTER.

Mr. W. R. Davis, Galion, Crawford county, Ohio, asks information in regard to sowing plaster, and whether two bushels are as good as ten.

Mr. John Crane.—I generally put on about two bushels to the acre.

Mr. Solon Robinson.—He must experiment on his land and see what it requires, for on some soils it will do but little good. It is reported to fail in many places on the sea coast. I have used it without much effect. But fifty miles further in the country it produces astonishing results.

Dr. J. E. Snodgrass.—I have had a good deal of experience in the Shenandoah Valley. I would put on three or even five bushels for spring wheat.

Dr. Isaac P. Trimble.—A bushel of plaster has great effect. People did not like to use it at first, but after a trial they have found great advantage in its use. After the soil gets a good supply of phosphate of lime, it will not need plaster. It is important to understand this.

### A SINGULAR GOURD.

Dr. J. C. V. Smith.—I wish to point to this gourd, which was grown in this city at Highbridge. It is over seven feet long. These gourds are found in Africa, where they grow on trees, from which they hang down, looking like boa constrictors; they will grow in this country against a wall with a southern aspect. Cattle and swine are fond of them when dry; they are also good for fuel; they are easy to raise, and they grow rapidly.

### BRIDGEPORT KNITTING MACHINE.

The Bridgeport Knitting Machine Company exhibited one of their machines. It is worked like a sewing machine, with a treadle, and the knitting is done by a revolving belt of loup needles, while widening and narrowing are performed by adding to or taking from the number of loup needles. The machine is said to work very well, and as it is cheaper than the old kinds it ought to come into general use.

### PAINE'S STOVEPIPE CYLINDER.

Mr. J. C. Paine, Dubuque, Iowa, sent for the inspection of the Club a new stovepipe cylinder. This new invention consists of a sheet-iron cylinder, provided with dampers, which may be opened or closed at pleasure. The object of the device is to retain and save the waste heat from a stove. After a critical examination, the cylinder was highly approved as an excellent device for the purposes for which it is designed.

### AGRICULTURE IN SALEM COUNTY, N. J.

The committee appointed by this Club some time ago, to visit the county of Salem, N. J., report that the invitation was extended by practical farmers who read the report of our proceedings, and who wished to confer with us in our efforts to advance the great art of agriculture. The county of Salem is between the latitudes of thirty-nine and forty, and bordered on the west by the Delaware river. The old town of Salem is the county seat, about forty miles south of Philadelphia, with which there is daily communication, both by steamboat and railroad. This part of New Jersey was first settled by a few Swedes, more than two hundred years ago, but they soon gave way to a community of Friends or Quakers, under the leadership of John Fenwick, in 1675. The descendants of these Friends are still in possession of most of the lands originally taken up by their ancestors. We were shown farms of which a transfer deed had never been made, the property passing to the natural heirs for a succession of generations for nearly two hundred years. Some families had died out, and rum and the sheriff, acting in concert, as they too often do, had changed the descent of a few, so that the people we visited are not all Quakers, but to the Friends chiefly belong the merit of the superb agriculture that we had the pleasure of seeing during this most interesting visit. The country is gently rolling, neither dead levels nor steep hills. The soil is light, but not sandy. We saw neither rocks nor stones. Like other portions of South Jersey, and especially the great counties of Monmouth and Burlington, this county was at one time so impoverished by the old system of farming, that many people sold out and emigrated to the new lands of the West. We were shown fields now producing seventy and eighty bushels of shelled corn to the acre, that fifty years ago were lying in common, and were the resort of the people for blackberries. A rotation of crops, the use of clover; and marl and lime as fertilizers, together with the crops of hay from the redeemed marshes, have changed all this, and it would now be impossible to imagine there had ever been a time when people had left Salem because it was so poor.

Many young men who have had no practical experience, have a fancy for farming. Some try it, and too often find that their visions of profit and happiness are not easily realized. Many fail as they would in any other business for which they were not prepared. We are often appealed to in this Club for information. There are valuable works on agriculture. Many of the agricultural journals are very valuable. But none of them would be of much use to men who have had no practical experience. Twelve months apprenticeship to a Salem county farmer would enable such people to read to advantage. But as all cannot be so educated, the committee propose to give an account of the farming operations they saw, premising that as the farming lands in the State of New Jersey, according to the United States census of 1860, were valued at twenty-three dollars and forty cents per acre more than the farming lands of any other State in the Union; and as the lands in Salem county have a higher value than those of any other county in the State of New Jersey, and as the townships we visited are the best of that county, we take it for granted that the farms we saw are suited for models, and that their owners may be considered pattern agriculturists of our country. And here let it be understood that we are speaking of a part of Salem county alone, and not of New Jersey. The farms and farming of different sections differ very greatly. Some sections are hilly and stony, others are level and sandy.

The size of the farms we saw would average about one hundred and fifty acres—divided into fields of ten, twenty or thirty acres.

Corn is the most important crop. In our travels we saw some sixty or seventy corn fields, nearly all of which were very much alike. It is planted in rows, from four to four and a half feet apart each way, and three grains to the hill. When grown, the stalks averaged ten or eleven feet high; we saw some fifteen, or even sixteen feet. The average product to the acre of the fields we saw in a day's ride, we estimated at from seventy to eighty bushels of shelled corn. Some seasons it exceeds this, and we were told that fields have yielded from one hundred and ten to one hundred and twenty bushels per acre. One farmer—David Petit (a valued correspondent of this Club)—has been experimenting for years to increase the size of the ears of corn, and has succeeded wonderfully. He has them now so large, that when such seed is planted four feet each way, with two stalks to the hill and but one ear to each stalk, the yield would be one hundred and twenty bushels to the acre. He has had ears of corn producing more than two thousand grains. The time of planting is early in May, and the cultivation is very careful. Most of the fields are worked over eight or ten times, and wet as the season has been, scarcely any weeds were to be seen. We found that the gang-plow of Riggs was much used, and were told that nine acres a day could be cultivated with this machine.

Oats were formerly sown to succeed the crop of corn, but as the land has become richer, the growth of the straw is too rank.

Wheat is often sown immediately after the corn, but this involves much labor. The carrying off the fields the whole of the stalks and corn in the green state, is the heaviest work of the year, and this rotation is not generally adopted on that account.

Frequently, two or more crops of corn are planted in succession, even upon the uplands, and the lands here bear it well, though it would be considered bad farming almost anywhere else in the State. Corn has been grown on some of the redeemed meadows for more than thirty years in succession, and all the crops equally good.

The potato is a common intermediate crop between corn and wheat. As in Monmouth, the potato is one of the most important staples of Salem. Early this season the promise was very great, but owing to the excessive rains, the first and largest tubers rotted; but most fields were still found to yield from one hundred to one hundred and fifty bushels to the acre.

Next to corn comes wheat in importance. We saw the barns and the stacks, but all evidence of where the wheat had grown in the fields, was lost by the dense growth of clover, In most of the stubble-fields this young clover was mown this season. We were told that such hay was of but little value, except for litter, but it would be in the way of mowing the crops next year. One farmer said he took it off so as to be better able to apply a coat of marl. The usual crop is from twenty to thirty bushels per acre, but as high as forty bushels had been grown. The drill is chiefly used in the cultivation of wheat; it saves about half a bushel of seed to the acre; and leaving the earth ridged up between the rows of grain, so as gradually to fall in about the roots of the young plants during the winter and spring is another advantage.

The growth of clover here is very rank. We saw no Canada thistle, or any other thistles; no wild carrots or parsnips; very few bull's-eye daisy, or any other weeds. Clover and other valuable grasses claim all the room in this part of the country.

With such bountiful crops of grass, we were somewhat surprised that grazing was not more general. We were told that the fly, so annoying to stock, was so troublesome in the latter part of the summer as to prevent cattle from fattening. This fly is common to all parts of the country; it is about the size of the common house-fly, rather darker colored, and having a cutting apparatus that enables it to draw the blood of domestic animals. Still, we saw several good-sized dairies, and a few farms that were chiefly devoted to the feeding of beef cattle. On these farms we saw pasture fields that had not been plowed for thirty or forty years, and densely covered with the natural grasses—green or blue grass and white clover.

*Fruit.*—Peach orchards were seen on some of the less valuable lands; but, as in other parts of New Jersey and the Middle States, the disease called the "yellows," is here. The first crop of trees on new land will produce three or four crops; but a second orchard on the same land, or even in the neighborhood, will frequently not produce a single crop.

Apple trees are grown by all the farmers, but very few of the orchards are large ones. The trees are large and vigorous, and occasionally the crops are abundant. One farmer, David Petit, told us that last year an orchard of his, of two hundred trees, produced an average of twelve bushels to the tree, and as the sorts were all good, that was his best crop of the season. This year he is almost without apples. There was a thin crop early in the season, but it all fell off. Here we also saw a large number of pear trees, and producing a full crop; many kinds, and especially the Seckel, very fine. We found some traditional knowledge of plums and apricots, but the insect enemies are here as in other parts of the country, and although these insects find occasionally more apples than they want in Salem, they are in most seasons commanders of the situation.

*Clover Seed.*—One thousand bushels of this seed is an annual crop, and we were told that one season ninety thousand bushels, worth about one dollar a bushel, of herds grass or red top, were sold from this county. This last is all gathered from the marsh meadows, and is half that is raised in the United States.

*Timber.*—The original growth is nearly gone. We heard of sales of the timber alone at the rate of from one hundred dollars to two hundred dollars an acre. As this land is now so valuable for agriculture, the timber will be soon all sold off. As the size of trees indicate the strength of the soil, we give the measurement of one tree (a white oak) we saw in the midst of a field: Twenty-six feet in circumference, one hundred feet high, and estimated to produce twenty-five cords of wood—the tree not yet one hundred and eighty years old.

*Fertilizers.*—Two of the three beds of marl that underlie so much of South Jersey are found in parts of this county, and marl has been used here for more than forty years. We saw where acres had been dug away. At one of the pits a steam dredge, similar to that of Squankum, Monmouth county, has just been put in operation, and is doing well, being capable of taking out from under water a ton a minute. The West Jersey Marl Works are in the same neighborhood, from which immense quantities are transported annually, both by water and railroad. A stratum of limestone is also found here, lying between two layers of marl. This is burnt in large quantities, and used on the land.

Large parts of the county, more immediately bordering the Delaware river, are alluvial. They are deposits of mud, and originally covered with water at high tide. Thousands of acres of this land have been reclaimed by dikes and sluice-gates. We were shown a place where, in a radius of one mile, seventeen hundred acres of these lands were now valuable meadows. Hay is the chief crop of these meadows, and as they are inexhaustibly fertile, this hay goes to the enriching of the upland portion of the owner's farm.

In several of the counties of South Jersey much attention is paid to the making of pork. A spirited rivalry has been kept up for years. A Salem county farmer has been the victor, slaughtering in a single season forty hogs, fed on his own farm, whose average weight was five hundred pounds.

*Machinery.*—It has been supposed that agricultural machinery could not be available on small farms—that men must have large tracts of land to justify the expense. This is not the case in Salem. Here we saw every modern invention to save labor. The mower, the reaper, the gang-plow and the horse-rake, each managed by the farmer himself, comfortably seated behind a pair of well-fed horses.

*Labor.*—The farmers of Salem all work, and so do their families, sons and daughters.

*Fencing.*—The fencing material is chiefly white cedar. Cedar rails are light, straight and very durable. The fences are nearly all worm, or Virginia, and the post and rail. The former is kept in position by iron bolts at the corners, instead of stakes and riders.

This is a great improvement, taking up less room and requiring less material. Stock cannot overturn it, and even the winds seldom disturb it. We saw a few live hedges that had been planted many years, but these, unless constantly pruned, were found to spread out far on both sides, and, besides robbing the soil, became harbors for briers, elders and weeds. They here have local laws against the running at large of cattle or other stock; consequently all fencing is for the farmer's own convenience, and not required for protection from others. The next step will probably be the abolishing of fences altogether.

*Climate.*—Here we found the holly, magnolia and persimmon, as in Virginia and the Carolinas, but most other trees and shrubs were like our own.

*Of Birds*, the buzzard and osprey were common, reminding us still more of the South. The buzzard, being harmless in all respects, and known as a scavenger, is let alone, and becomes almost domesticated. The remnant of an old tree was pointed out that had been the abode of broods of young ospreys for forty years. But the blackbirds here were a still greater curiosity. Millions collect annually about the marshes of the lower Delaware. A reed, called wild oats, grows in great abundance on the marshes that have not been diked. This produces a seed, ripening in September, that is a favorite food of many birds. It would seem that all the black birds of North America have a knowledge of this food, as the canvas-back duck has of the wild celery of the Chesapeake. These birds are often very troublesome in the corn fields while waiting for the ripening of this wild oats. They then attack the corn in its milky state, generally taking only a small part of the end of the ear, but so stripping off the husk as to let in the rain, and the entire ear is often destroyed. The farmers are frequently compelled to make a war on these marauders. But a word can be said on the other side of the blackbird question. These birds are supposed by many to pull up the sprouting corn in the spring to get the grain. One of our Salem friends told us that he had watched these birds flying constantly between the trees, where they had their nests in his corn field. He shot some, with the suspicion that they were at mischief; their stomachs contained cut-worms, and nothing but cut-worms. Those who have investigated in this way kill no more small birds.

The reed bird or bob-o'-link of the North, concentrates here also in vast numbers, feeding to wonderful fatness upon the wild oats, and are shot by thousands for the epicures of Philadelphia. The people who eat these little birds probably do not know what special favorites they are with us; how elegant their summer plumage, how amusing their chatter, or how useful they are as feeding upon the canker worm and other injurious insects.

Our travels in Salem county, included some thirty or forty miles. We were in four townships, but our observations were chiefly in one—Mannington. As this township is exclusively agricultural (all farms), the following statistics are valuable:

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| Whole number of acres of improved land | 18,696 |
| Average value per acre | $110 |
| Unimproved land, including meadow, acres | 4,106 |
| Average value of this | $22 |
| Of the whole the average value is | 92 |
| Add one-half value or about what the whole would sell for | 138 |

But most of the farms would bring about $200 per acre.

The value of this township for taxable purposes is more than $3,000,000.

As population increases, the question of how much richer rich land can be made, will be one of the great problems in agriculture. It has been found that six tons of marl to an acre, on poor land or worn-out land, will double its value by doubling the crops. A Salem county farmer told us that he had once put marl into the hills of potatoes, and that, seven years after, wheat on that field showed plainly the spots of marl.

If all subsequent applications would produce similar effects to these, farming would soon become one of the exact sciences. But this is not so. A soil exclusively of marl would produce nothing. Neither would one of lime, or ashes, or gypsum, or barnyard manure. Just how to regulate all this—how to alternate the applications, of fertilizers and how much to apply at each time, together with a proper rotation of crops, so as to produce the most human food and the most profit, will some day become the profoundest question of political economy. The agricultural chemist and the practical farmer acting in concert may approximate, but it will still be an unfinished science. The farmers in the township of Mannington are working at this problem, not only as farmers, but the libraries we saw there showed them to be men of science also. Were all the three millions of acres of farming land in the State of New Jersey worth $138 per acre, the total would be more than $400,000,000, and did every acre produce as much human food as these acres in Mannington, then might

> "Every rood of ground maintain its man,"

And all the people of both the cities of New York and Philadelphia could have food enough without the additional charge of freight on such long lines of railroads. And why not? We have the acres, the fertilizers, and hundreds of farms as examples to prove that it can be done.

Prof. Cooke, the Geologist of the State, says, that there are two hundred and seventy-four thousand acres of tide-water marsh in the State of New Jersey. That only about thirty thousand acres of this vast amount have yet been redeemed, and that the half of this, or fifteen thousand acres, is in Salem county alone. The diking of these marshes was commenced early in the history of Salem, and we were shown a canal several miles in length exclusively for drainage, that was excavated by a steam dredge many years ago. Between this city and Newark, N. J., they are now diking several thousand acres of marsh, but the labor is performed by men alone. We have been told that history repeats itself. This use of the spade as against the steam engine for digging canals through mud looks like a repetition of the lost arts.

In concluding this report, it will be proper to speak of the farmers themselves who have built up the agriculture of Salem county. A farmer whose crops are uniformly profitable will attract the attention of his neighbors, and if their crops are not as good, they will soon begin to imitate his example. As all the operations on a farm, as well as the crops, can be seen by the entire community, such a farmer becomes a teacher; but when there is an entire settlement of such farmers their influence for good is immensely increased. This settlement we saw was originally made by Friends, or Quakers, and they, in a great measure, have made Salem county agriculture what it is. Just such settlements of Friends can be found in many other counties of the State, and especially in Burlington; so in Eastern Pennsylvania, and in many other States. But especially is this the case in Ohio, Indiana and Iowa, where a large portion of the population is of this denomination of Christians. Go where you will, if you find a settlement of Friends, there will be the same characteristics—soil naturally good, careful cultivation, neat and substantial buildings, thrift, comfort, intelligence, and finally wealth; and, as a consequence, such success causing others to imitate their example. To the quiet influence of just such farmers is the present prosperous condition of agriculture greatly indebted.

We have nothing to do with the theology of these people; but we take the liberty of quoting a few paragraphs from their moral laws or system of discipline, that may have had an influence in making them such citizens and such farmers:

"Are the necessities of the *poor* duly inspected, and they relieved or assisted in business?"

"Do the children of the poor *freely* partake of learning to fit them for business?"

"Are all members careful to live within the bounds of their circumstances? Are they punctual to their promises, and just in the payment of their debts?"

"Are all offenders dealt with without partiality?" &c., &c.

The distillation, or the sale, or the drinking of spirituous liquors are absolutely forbidden.

The above are only a few items; but they show the spirit of the whole system of government.

After visiting the superb farms of these Salem county Friends, and partaking of their plain but bountiful hospitality, we felt as General Howard did when summing up the comparative merits of various denominations in their contributions to the Christian commission during the war, "God bless the Quakers."

ISAAC P. TRIMBLE,
J. V. C. SMITH, } *Committee.*
THOS. CAVANACH,

The committee were accompanied by Gen. N. N. Halsted and Col. R. S. Swords, of the New Jersey State Agricultural Society.

### SIOUX CITY, IOWA.

Mr. G. T. Smith, Sioux City, Iowa.—People here can't understand why Eastern farmers will toil and starve on worn-out lands and New Jersey barrens, when there is so much good land in Northwestern Iowa, Nebraska, and Dakota, to be had for homesteads, or if preferred, for cash or scrip, at from one dollar and twenty-five cents to two dollars and fifty cents an acre. I know of one man who raised 808 bushels No. 1 spring wheat on twenty-six acres. He sowed fifty bushels seed. Another, from forty-one acres, produced 1,264 bushels. This wheat is worth here one dollar and forty cents, cash. These are not exceptional farms, but about the usual average for wheat in this region. Winter wheat is not grown to any extent. The season is generally too short for good corn; when it is favorable, corn grows as well here as in any country in the world. It is now worth one dollar; potatoes, one dollar and fifty cents. Staple dry goods and groceries are as cheap as in the East, freight added. Best Rio coffee, thirty-three and one-third cents; sugar, fifteen to twenty cents; tea, one dollar and twenty-five cents to two dollars and fifty cents; calico, fourteen cents. Cottonwood lumber, twenty to twenty-five dollars per thousand; pine, fifty to one hundred dollars; wood, four to six dollars per cord; shingles, four dollars per thousand; brick, eight dollars per thousand.

Sioux City is 600 miles by land, and 1,000 miles by water, from St. Louis, 2,200 from Fort Benton, 500 from Chicago. There are three railroads on the way, terminating here—one from St. Paul, one from Dubuque, and the Sioux City branch of the Union Pacific. The latter is nearly completed—will be done this winter, or in early spring; the others in a couple of years. Population of the city, 1,500; county, 3,000. We have five churches, supplied with ministers, and one more being built. Schools are good; daily attendance about 350. Common laborers get one dollar and seventy-five cents per day; mechanics, three dollars and fifty cents to five dollars.

Two and a half miles above town, the Big Sioux river empties into the Missouri. This is a beautiful, clear stream, 100 to 200 yards wide for 100 miles, well timbered on each bank with hard wood. This is the boundary between Dakota and Iowa. Plenty of good claims are to be had along this stream, twenty to fifty miles up. Considerable of the land in Northwestern Iowa is held by railroads, which advances the price of the remainder to two dollars and fifty cents.

Stock raising is very profitable. Cattle, horses and sheep do well. Prairie hay can be put up for three dollars a ton. We have an excellent market for stock at the military posts and reservations on the Upper Missouri. We want active, enterprising men to settle the country and develop it. Those who are very poor, better not come with a view of taking homesteads, for it is an up-hill business unless a man has at least capital enough to last him a year. The climate is healthy—very little fever and ague or lung diseases. To get here, take the Chicago and Northwestern railroad to St. Johns, thence by rail and stage.

Mr. N. C. Meeker.—There can be no doubt but this is a good country, and that the figures are correct. But in a new country wheat always does better than ever after. Illinois land has raised no wheat equal to what she produced twenty years ago. People going West need to be informed that they will see many privations, that from these sickness naturally follows, and it is doubtful whether a man going from the East to the West did not many times, during the first year, regret that he had come. This must be understood. But after they get settled, the prospect changes, and they cannot be hired to go back.

### CHINESE YAM, OR DIOSCOREA BATATAS.

A letter from Mr. Tyler was read, stating that he had received tubers of the Chinese yam, presented by Mr. Prince last spring, and had grown some of the long yams, resembling sweet potatoes, and he desires to know how he should preserve these yams during winter.

Mr. Wm. R. Prince responded by stating that the roots should be preserved dry and free from frost during the winter, in the same manner as the common potato, or they may, if convenient, be preserved in sand; but the roots are so hardy that they may be left in ground all winter without any injury, even in the most northern portions of our country, where the common potato, on account of its southern origin, cannot be grown with any success. Mr. Prince stated that he is now preparing an ample exposition of the character and constituents of this root, which will go to prove that it is the most important and valuable esculent which the Creator has placed upon our globe. He declared it to be the most nutritious and excellent, the easiest of culture, and the most productive of all the field vegetables; and that being a native of Northern China, bordering on Tartary, it is adapted by nature to the most northern latitudes. It comprises the substantial aliment of fully two-thirds of the inhabitants of the vast Chinese Empire, and if deprived of it, more than two hundred millions of people would perish from famine.

Mr. Prince remarked thus: I bid you note well what I now tell you with a prophetic spirit. This esculent is the only appropriate national resource on which our country can rely when the potato fails us, and it is of immensely greater importance and value. Those who have denounced it have never tested it fairly, and are utterly ignorant of its true character.

### SALT AS MANURE.

Mr. H. Merriam, Oswego Falls, N. Y., wants to know how much salt should be put on an acre of wheat, and whether in the fall or spring; also, as to its application on corn.

Mr. N. C. Meeker.—There have been no definite experiments which guide us to whether salt is useful except on grass, or on some peculiar soils, and it seems very doubtful whether it is a universal manure at all. It is said to have a good effect on potatoes, when used with wood ashes — one bushel of salt to ten of ashes. If anybody knows more, they can tell it.

### MARKET CART OR WAGON.

Mr. Walter Hyde, New York, exhibited a neatly made, convenient and light four-wheeled market cart or wagon, with rigid axletrees, arranged expressly for crossing gutters and traversing sidewalks in the city. Adjourned.

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## November 26, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### GARDENS HEAVILY MANURED.

Mr. Isaac H. Cox, Bridgeton, N. J., inquired why gardens heavily-manured for a number of years become unproductive.

Prof. Nash.—There is not enough alkaline in the soil. I know of a farm in Conway, Mass., that was in the same condition, but it has become productive by the use of lime. Wood ashes and deep plowing are beneficial in cases where too much, or where the wrong kind of manure has been used. Mr. Henderson tells us, that after a farm has been manured for a number of years, a change is of as much importance as a change of crops.

Mr. Thomas Cavanach.—Too much light manure is not good; more lime should be used in such cases. I have had experience in many such gardens, and to correct this have trenched deeply and added lime.

Dr. Isaac P. Trimble.—The garden of the hospital at Philadelphia, though highly-manured, would produce nothing; even seeds would not germinate. At last they sowed clover, and after it had been grown several years the fertility was restored.

Mr. S. Edwards Todd.—The trouble is that oftentimes farmers do not make the proper distinction between the different manures used. When we wish to raise grain, we should put on more of the grain-producing material.

Mr. P. T. Quinn.—This subject is one of great importance. We need to know much more about the special manures required for special crops, and it deserves special attention by this Club.

Dr. J. E. Snodgrass.—It is a well-known fact that in some places onions will not grow, no matter what is used for manure. That the atmosphere effects fertilizers is entirely overlooked.

Mr. Wm. Lawton.—I think we attach too much importance to ground being too highly manured. It is a well-known fact, that, when too much manure is used, all that is required is to plow deeper. Not one in a thousand uses too much manure. I am living on a place that has been manured since 1690; the soil is eight inches deep, and good crops are still produced. The Harlem flats have been highly manured for many years, and still produce heavy crops of vegetables.

### GAS LIME.

A gardener said he had come two hundred miles to know the value of gas lime.

Mr. Cavanach stated that he has known farmers to use it with excellent results.

The inquirer stated that a friend of his had applied gas lime to some of his grass, and the lime killed all the grass as dead as if it had been burned. Afterward, a new crop appeared and grew luxuriantly and very large, so that the grass where the gas lime was applied, was tall and heavy, while the grass round about the ground on which the lime was spread, never grew only about half as large and heavy as that on the limed soil.

Mr. P. T. Quinn said it had the same effect as common lime; it should be exposed to the atmosphere for a year before being applied.

The Chairman stated that the experiment afforded conclusive evidence that there is great efficacy in gas lime when applied as a fertilizer.

### SOWING THE SEED OF FOREST TREES.

Mr. W. P. Clark, Salem, N. J.—Timber is growing continually scarcer in this vicinity. Would it pay to sow the seed of hickories, black walnuts and oaks?

Dr. Isaac P. Trimble.—The people around Salem cannot afford to raise timber. The land is altogether too valuable.

Prof. Nash.—I do not believe there is a place on the globe where it is not profitable to have one-quarter of the land in timber.

### FARMING IN LIBERIA.

The Chairman introduced Lieut. L. L. Lloyd, a colored gentleman, who is acquainted with farming in Liberia, and who was with Prof. Agassiz in his travels. He took the platform with politeness and perfect self-possession, and, in good language, addressed the Club on farming in his native country. The speaker was brought to Boston from Nubia, when a child, and was assisted in educating himself, by the Hon. J. V. C. Smith, ex-mayor of Boston, the Hon. Edward Everett, Prof. Agassiz, and others. Recently he has lived in Liberia. The Lieutenant said:

"It is needless for me to describe the geographical position of the country from whence I come. Mr. President, knowing that but a few moments will be allowed me, I shall at first explain the method of cultivating the sugar-cane in Africa. The climate is divided there into but two seasons, the wet and the dry. The first of December is the commencement of our summer, and the first of May the beginning of our winter, which is the wet season. In December and January we usually fell the large trees, and about the first of February we cut the undergrowth, which is perfectly dry in a few days, and is then fired and burned off. The larger timbers are cut and used for fuel, in boiling the cane. We then open holes from six to ten inches in depth, into each of which several joints of the cane are laid horizontally, then covered; this completes the process of planting. The product is from five to eight stalks per hill, and the time required for the perfection of the growth is from ten to eleven months. The quantity of sugar produced per acre, averages from fifteen hundred to two thousand pounds; but there are choice lands that have yielded as high as three thousand pounds per acre. Before the war, sugar from Liberia brought from five and a half to seven and a half cents per pound, but since, it has brought from nine and a half to twelve cents per pound. New lands can be cleared and planted at a cost not exceeding twenty to thirty dollars an acre; but the want of capital to pay the native laborers has prevented many from extending this branch of agriculture; for the natives will not work and wait for their pay until the maturity of the crop. Liberian molasses and sirup bring fair paying prices in both the European and American markets. The soil of Africa is as varied and prolific as any on the globe. We have commenced the cultivation of coffee on a much larger scale than heretofore. Crops of coffee can be produced from the seed in six years, but the impulsive and passionate nature of the son of the tropics renders him impatient; consequently, before the war, but few were engaged in its cultivation; but the high prices which the staple commanded during the rebellion in this country, has induced many to engage more extensively in its cultivation. There are about four million coffee trees in the whole Republic, and probably between one million and two million in bearing. The first year the tree yields but a very little, increasing each year, until it bears from three to six pounds per annum. It is a lamentable fact that about one-third of the coffee crop of Liberia goes to waste for want of proper picking. Liberian coffee ranks with the best brands, but it is bought up by private individuals in Europe and America, and seldom reaches the general market. Sufficient capital, if properly directed, would make Liberia one of the best, if not the first, coffee-growing countries in the world. It is a great pity that the majority of emigrants to Liberia are poor in pocket and limited in understanding. Arrowroot of this section is equal in quality to that from Bermuda, but the Liberians have not yet attained an equal proficiency in its preparation for the market. The ginger is as good as that raised in Sierra Leone, and commands as high prices. Ginger is largely exported from the West Coast of Africa. Our soil is well adapted to pepper, which is being produced in large quantities. Gentlemen, rejoice with me that Africa is on the forward and upward march to a higher and nobler position in the civilized world. Cotton is also one of the products of Liberia, but the reason why it is not exported is, because the natives use it for making cloth, which is better known as the African blanket, which they wear during the wet season. These blankets are bought up in large quantities by the English traders, and shipped to different parts of the coast. The course that John Bull is pursuing in relation to Liberia, is certainly strange. With all his power, Christianity and civilization, he now claims nearly all the valuable country northwest of Cape Mount, asserting that Liberia did not buy it from the natives; but we claim the right of possession, whether from purchase or political jurisdiction.

"The truth is, that it is the key and valley-pass of unknown Ethiopia, and if the American people will do their duty toward those who emigrated from their soil to erect a great black nationality in Africa, and if we continue in our present views, which, by the help of God, we intend to do, there will be a grand cotillon party the day the English attempt to take possession. Our fathers were forcibly brought from Africa, and some of their descendants in the spirit of the Pilgrim fathers, who settled in America, are determined to establish the fact that the negro is, and of right ought to be, the master of the tropical world. The great desire of the English Government for the possession of this portion of the country is from the fact that this is the grand opening to the interior, leading directly through the cotton country, whose kings are favorable to Liberia, and would remain so, if not meddled with by those governed by the principles of greed and gain. The foot of civilized man never trod many parts of this rich valley.

"Mr. President, I feel highly honored by having been invited to speak before these learned gentlemen, who do not seem to fear that my complexion is contagious, or that I am excessively odoriferous. I can assure you that in lecturing throughout the country, as I hope to do this winter, I shall not forget your cordial reception. The future of the negro is certainly growing brighter in the tropics, and ere long we hope to compare favorably with this enlightened country, particularly in matters of agriculture."

Dr. J. V. C. Smith.—Mr. Lloyd is a personal acquaintance. He was born in Nubia, that country in which the Queen of Sheba reigned. It is not likely that he knows much about the region, for he left it when young; but I have visited it, and saw most stupendous ruins, which give evidence that once it was the seat of the arts, and, for those days, a high civilization.

Mr. P. T. Quinn offered the following resolution:

"*Resolved*, That the thanks of the Farmers' Club of the American Institute be, and they are hereby tendered to Lieut. Lloyd, of Liberia, for his intelligent, able, and most interesting remarks on the advantages offered by that country to immigrants, and his account of the way in which the staple crops are produced."

Mr. Arnold, of Delaware, seconded the resolution, which was unanimously adopted.

### TRANSPLANTING EVERGREENS AND OTHER TREES.

Mr. C. A. Hall, Richmond, St. Croix, Wis.—I would beg permission to state one fact in relation to transplanting evergreens. Never remove them until the buds have become sufficiently swollen to show the green. If this condition is complied with, not one in a hundred will be lost. The reason is, the buds are hermetically sealed up with a gum that exudes from the tree, when the tree is removed before the buds have swollen. This gum dries hard, and all the latent forces of the tree cannot disentomb it. I would also like to state a fact in relation to transplanting the sugar maple. Never disturb them while in the full flow of sap. You might as well cut off a man's head, arms, and feet, and then expect him to live and grow. Go into the forest after the leaves are just out, select and mark the trees you wish to remove, cut them back as much as you like, then leave them until the next spring, and new sprouts will shoot out in every direction. Next spring when the flow of sap is over, and the buds are about bursting, they may be safely transplanted, and you will lose none of them.

### TIME-REGISTERING BAROMETER.

Mr. G. V. Mooney, No. 53 Fulton street, New York, exhibited a time registering barometer, which seemed to possess some new and striking features. A chronometer or clock is held in the upper end of a long case which holds the barometer tube and also a thermometer. The exhibitor thought a time-registering barometer to be a very useful affair for every farmer.

Mr. Baldwin stated that he has a barometer, which he has been watching with much satisfaction the past season, and he finds that it indicates the approach of a storm with satisfactory accuracy.

### MANAGEMENT OF BEES.

Mr. Jasper Hazen, Albany, N. Y., spoke on the management of honey bees. He stated that he took 174 pounds of honey from one hive last summer. He employs a hive of peculiar construction.

Adjourned.

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## December 3, 1867.

Prof. S. D. Tillman in the chair; Mr. John W. Chambers, Secretary.

### POTATO GROWING.

Mr. S. D. Heffron, of Utica.—I came to speak of raising potatoes. The Rev. Mr. Goodrich, who has done more than any other man in the potato business, said it was the poor man's bread. When we have a poor crop, it affects the purses of the farmers in many sections. My object is to speak of the early Goodrich. One reason why many fail in raising this variety is because they plant too much seed. They should be well manured. In growing potatoes from the seed, we get first fifty to sixty varieties. Some do well from year to year and improve, and it takes ten years to perfect them, while others rot the first year. One who commences to grow potatoes from seedlings, will have to cull and select those which are the most perfect in every particular. I do not speak of the early Goodrich because I have them to sell, but because I honestly think it gives the best satisfaction. The Irish potato is a native of South America. Potatoes, like people, become sickly when removed to an uncongenial locality. Mr. Goodrich brought from South America several varieties, from which he propagated the Garnet Chili, the early Goodrich, Gleason and others. The speaker related how little Mr. Goodrich had received for the great good he had done the country; and although he spent eleven years in striving to get a healthy potato, he only received about one hundred dollars, beside the four hundred dollars he received from the agricultural societies.

Mr. Wm. S. Carpenter.—This Club has often been interested by scientific discourses, but I do think that we have been unusually instructed by this one, on the potato, and I move a vote of thanks. Mr. Heffron, it is understood, is carrying on the work commenced by Mr. Goodrich.

Mr. J. C. Thompson.—I have found much benefit by sprinkling ashes on potatoes at planting, and also immediately upon their coming up.

Mr. E. Williams.—In regard to potato disease, I think great care should be taken in selecting good seed. From a piece of ground measuring fifty-six by fifty-six rods square, I raised sixty bushels. I like the early Goodrich the best. One prominent cause of the potato rot is selecting inferior potatoes from year to year for seed. Instead of planting the poorest, he said we should plant the very best potatoes.

Mr. Wm. S. Carpenter thought farmers do not change their seed as much as they ought to. He was confident that farmers almost always experience great advantage from changing their seed potatoes with people in distant parts of the country.

It appears that it has been the practice for many years past to plant all such potatoes as were not marketable, nor desirable potatoes for the table. By this means the varieties have been nearly run out, and the potato has become diseased and unable to produce sound and healthful tubers. New varieties must be originated, and the fairest and best tubers must be saved for seed. Then we shall not hear so much about the failure of the potato crop.

Mr. J. C. Thompson, Staten Island, detailed some of his experience in the culture of early potatoes. He plants cuttings in a shallow box, covers them with sand, and keeps them in the kitchen until the growing season has commenced; then plants them out, and he has new potatoes by the middle of June.

### ASHES.

Mr. Joel Zook, Smithville, Ohio.—Are ashes which have been exposed for months worth hauling on land ? and what kind of wood makes the best ashes ?

Mr. N. C. Meeker.—If the ashes are on your own land it will pay to haul them as much as to haul manure. We always save the ashes of a leach. There is no manure so good for strawberies as ashes, and they are excellent for grass. They are of great advantage on clay land. Unleached are best, of course; still, the leached are valuable—probably worth more than stable manure. Hickory, beech and maple wood make the best ashes. Elm is said to be good.

### RAW BONE FERTILIZER.

Mr. T. H. Collins inquired, how much ground bone should be applied per acre for the production of wheat?

Dr. W. P. Peck.—It is difficult to answer those questions, as bone dust decomposes so slowly. It is a lasting manure; but it is difficult to tell how much is sufficient for an acre. There is no danger of applying too much.

Mr. Wm. S. Carpenter.—Bone manure is an excellent fertilizer for wheat or any other crop. The finer the bone is, the sooner we get the results in a crop of grain. Westchester county farmers apply a large amount of bone manure for their wheat crops. I have seen the effects of a dressing of bone manure increase the value of the first crop more than the whole expense of the fertilizer purchased. It is always best to grind bone as fine as practicable, before sowing it, as the fine particles will not promote the growth of plants until they have been reduced to a fluid condition by moisture, heat and decomposition.

Mr. P. T. Quinn.—Bone is a valuable fertilizer. Recently, we have so improved our machinery as to reduce bones to the smallest possible fragments. The greate vallue of bones consists in the large proportion of phosphate of lime. The finer the bone is, the quicker we get the return in crops.

Those who spoke of the application of bone manure conveyed the idea that there is no danger of applying too much. Still, five hundred pounds would be a liberal dressing per acre.

### MORGAN'S HAY-PITCHER.

This is a device for elevating hay on the load while in the meadow. The main features consist of an erect standard ten or twelve feet high, secured to the hay rigging or shelving. On the top of this stand is a crane three or four feet in length. A rope passes from the fork on the ground over a pulley at the end of the crane, and over another pulley at the junction of the crane and the stand, and thence down to a drum which is attached to the wheel of the cart or wagon. The fork is thrust into a cock of hay, when, by starting the team, the forkful is elevated and dropped at pleasure on either end of the wagon. The inventor, Joseph Morgan, Springfield, Mass., having such a pitcher at Rye, a committee was designated to go and supervise its operation. On Monday, the 2d inst., J. H. Macy, J. B. Peck and S. E. Todd were the committee who appeared to witness the operation of the pitcher.

A load of hay was carted to the field and distributed in bunches weighing about one hundred pounds each. Then the hay was returned to the wagon by means of this pitcher. If simply pitching the hay on the load were all that is desired, the committee would cheerfully indorse this device as a valuable labor-saving machine, as the fork will elevate a cock of hay, weighing from one to two hundred pounds, in a few seconds. Under favorable circumstances, this pitcher would pitch a ton of hay on the wagon in eight or ten minutes, with comparative ease to the man who handles the fork. The committee were agreed that, so far as simply pitching hay is concerned, this device operates successfully. But there are points connected with the operation which they did not like. The team must be moving while the hay is being pitched on the wagon. Besides this, when a cock of hay is tumbled on the load at random, it is very difficult for even an expert loader to place the hay around, so as to make a load that will ride safely to the barn. A boy, or light man, who could make a square load, if the hay were pitched on in forkfuls of a moderate size, would find it extremely difficult to load hay satisfactorily, when it is rolled up and tumbled up in such large wads that he cannot move it readily, when portions of it must be placed in order to build a square load. The committee feel bound to set forth the disadvantages as well as to approbate the merits of all such labor-saving devices.

### SHEEP IN WEST VIRGINIA.

Mr. N. P. Atkinson, Elm Grove, Ohio county, West Virginia, says that in all sections north of forty degrees, luxuriant blue grass pastures can be had; and, if properly managed, will, in open winters, do much to sustain sheep. Lambs should be weaned by the middle of August, when they should be put in a clover field and taught to eat oats, and nothing will make them grow faster. It is important that sheep should be classified during the winter. The best fodder is hay; it should be cut from the middle of June to the middle of July, managed with the utmost care, and never get wet with rain or dew. Lambs fed with good hay and half a bushel of corn, or a bushel of oats, a day, to the hundred, will keep in good growing order. Not to have good water convenient is one of the greatest errors of sheep-growers. They should also have shelter. More sheep die from disease contracted by bad and insufficient food, and a want of shelter during the first two years of their existence, than from all other causes. Breeding ewes should be kept in fair condition all the time. By good keeping, one will have not only more wool but more lambs. My practice is to break up good ground for corn; the succeeding spring I sow oats, followed by wheat crop; a sufficient amount of timothy seed is sown at the time the wheat is harrowed; the following spring, about the 20th of April, I sow clover seed. By the above course of farming, I have fresh meadow every season; and it is a fact worthy of especial notice, that new meadows do not suffer from drouth like old ones. The farmer whose principal aim is to raise sheep, should make it a prime object to have an abundance of good hay, that will supersede the necessity of the sheep-killing system of feeding straw. To cut hay for sheep is lost labor, particularly because their digestive organs are more complete than most animals. If sheep are poor by December 1, they will be likely to remain so all winter. This year finishes up fifty years that I have kept sheep. During all the time, I have made it a practice to let them have, in winter, a range of the pastures in pleasant weather, and I think the health of the sheep and a saving of food have resulted.

### ANGORA GOAT.

Prof. Israel S. Diehl, commissioner to Asia to investigate the subject of the Asiatic goats and the process of converting their fleeces into fabrics of human clothing, was invited to give a statement of his adventures and successes. He told, in a few words, where he had been in Asia, what he had seen and what he had accomplished in collecting specimens of the fabrics that were made in Asia. Mr. Diehl has also brought one hundred and fifty choice goats to this country, two shepherd dogs, and numerous other things of great interest. He showed some specimens of cloth, such as he said he saw in Asia, that was said to have been made six hundred years ago. He also exhibited some beautiful articles of hosiery, which had been manufactured from the fleeces of these goats.

### SALT AS A MANURE FOR WHEAT.

Mr. George Steele, Thorndale, Chester county, Pennsylvania.—Salt with lime, and alone, has been applied as a manure for wheat, on the farm which I cultivate, for a number of years, with very good effect. From my own experience and observation of the effects of salt on this land, I am led to form the following estimate of its value as a manure: One and a-half sacks of merchantable ground salt, or an equivalent of dirty salt, and twenty-five bushels of lime per acre, produce as good wheat as a moderate dressing of stable manure, and the grass after the wheat is as good, where the salt and lime are applied, as where the stable manure was applied. The salt and lime have been applied after plowing, and harrowed in; the lime spread with a shovel or lime spreader, as soon as slacked, while in a powdered condition, and the salt sowed broadcast or mixed with the lime before spreading, or the lime slacked with brine; about twice the above-mentioned quantity of salt alone, I believe to be as good for this land as the salt and lime. The rocks here are talc slate. The soil, gravel, clay and loam was exhausted about seventy-five years ago, and its cultivation abandoned. It has since been reclaimed from barrenness by an improved system of agriculture, and the use of lime as a manure. The land to which the salt was applied had been frequently limed, which fact may be important in considering the effect of the salt applied alone.

### PREPARATION OF PEAT FOR FUEL.

Mr. Charles Hunt, Frankfort, Mich.—Most persons who write and theorize on the subject of utilizing peat for fuel, do so with the belief that some kind of machinery, more or less expensive, is necessary to prepare it by condensation or pressing. Hence, inventors have set their wits and hands to work, until, I am informed, some thirty odd different peat machines have been patented, varying in cost from one hundred dollars to one hundred thousand dollars. Some are, of course, worthless, even to the inventors; all are expensive, and, as I believe, worse than useless to those who would make peat-mining pay. Good peat, from well-drained bogs, properly handled, needs no further condensation than that which a hot sun will give it, as I now attempt to show. Mr. John Coburn, of Dracut, Mass., has a peat bog of seven acres, three miles from the city of Lowell. It was cleared long ago, and a deep, wide ditch put through the center, through which a lively stream of pure water, and of considerable volume, runs. The bog, in places, is twenty feet deep; it is pastured, and yields considerable feed; and the peat is so dense and firm, that horses, drawing loads, walk over it without danger or difficulty. It is almost perfectly black, is free from undecomposed fiber, and cuts out with the slane like plugs of tobacco. This year he has cut and cured several hundred tons, most of which he has sold in the city for five dollars a ton. Mr. Coburn used no machine, except a big Irishman with a slane, who cut it into shapely cakes or plugs, say fifteen inches long and three by four square, and laid them carefully on the sod beside the ditch. A boy loaded them with a four-tined fork upon a one-horse dray, and hauled them a few rods off, upon the clean sward, and spread them. Two or three days of hot sunshine made them ready to turn over; in three or four days the peat was fit to house in a loose shed with a roof that would turn water. I saw, some weeks since, a heap of a hundred or more tons of his peat in such a shed near his bog, ready for market, and I considered it superior in respect to size of lump, density, and coherence, to a similar pile I saw last spring at the manufactory of a large peat company—the company's peat being "condensed" by an extensively advertised machine. Major Durkee, also of Dracut, exhibited at the Middlesex (Mass.) county agricultural fair, specimens of a quantity of peat, dug from his own bog this year, and it was generally conceded to be better than that beside it, made by costly machinery. One man will cut out in a day enough raw peat to make five tons ready to burn. If owners of bogs will clear the surface, and thoroughly drain, so as to kill the ferns and coarse grasses, they can beat the best machine in the world making peat fuel, and money out of it. These facts should save many from buying expensive peat machinery.

### SOUTH JERSEY.

Mr. George Morden, Oakland, Mich., addressed a letter to the Club, making inquiries about the price of labor and land in South Jersey.

Mr. S. B. Nichols, Hammonton, N. J., spoke of South Jersey, and said that they do not claim that they can grow crops there without manure. His father says he can raise better crops there with half the manure that was necessary to produce a good crop in Vermont. Farm hands, he said, receive one dollar and fifty cents a day, and board themselves, or fiteen dollars per month and board. He would not advise a man to go there, unless he has three thousand dollars. Still, some poor men do go there, and do well. He says they have no waste land there. Men who are industrious and have but small means, can soon accumulate a fair competence. There is no waste land in that locality; and the climate is wonderfully salubrious, and the land is cheap and easily worked.

Prof. Nash asked what the discomforts are in Jersey in comparison with the discomforts of the Western States. In most of the Western States the pioneers, he said, die soon after they reach their new homes.

Mr. S. B. Nichols.—We have a single physician in Hammonton; and he is obliged to engage in some other business, or he would starve to death.

Mr. N. C. Meeker.—People do die in the West; but he thought the mortality is not so alarming as has been represented.

Mr. S. B. Nichols.—I could go to New Jersey with one thousand dollars, and succeed well. But some other men could not do it.

Prof. Nash.—Part of the West has been settled, in many localities, at an immense cost of human life. The location of much of the sandy land of New Jerey makes it valuable. Being between the two great cities, New York and Philadelphia, these markets will warrant the use of artificial fertilizers for the production of vegetables and fruits. Adjourned.

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## December 10, 1867.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### NORTH CAROLINA TEA—YEOPON.

Mr. H. C. Davis, Beaufort, N. C., forwarded a barrel of Yeopon. It is the same as the Mate of Paraguay, South America, which is highly esteemed; and a part was distributed. It is prepared in the same way as common tea or coffee. A pint will make a gallon. It is drank hot, and is a preventive of fever. Molasses and milk add to its goodness, and the cost of this tea is from forty to fifty cents a bushel.

Mr. Wm. Lawton.—Our tea from China is a valuable beverage; nothing is more invigorating to a weary person than a cup of good tea, and I commend its use. Two thirds of the people are sick with some ailment and need something of the kind.

Lieut. Lloyd, Monrovia, Africa.—We have a common tea growing wild in our country; it is found in the fields, streets and woods, and is in common use among us. On several occasions, when strangers were at our table, we have had both the native and China tea, but they were unable to tell the difference.

### PROPAGATION OF BLACKBERRIES BY CUTTINGS.

Mr. I. W. England, Ridgewood, Bergen county, N. J.—Blackberries and raspberries may be propagated without the aid of a hot bed. Millions of plants are so grown every year. Cut the roots up in the fall into two or three inch lengths, place them in a box with sand or earth enough to prevent their mildewing or heating by contact, bury the box in the open ground, a foot deep, till spring, then take the cuttings and sow in drills like peas, in rich soil, leaving space enough between the rows for the cultivation, and if they are kept clean, and have healthy, stout plants, nearly all the cuttings thus treated grow. The burying in the fall insures their thorough callusing, and they come out in the spring full of white buds ready to start into growth as soon as planted.

### TROUT.

Mr. James M. Sigafus, Bear Creek, Cal.—Is there any practical way to propagate trout? I have tried it for two years without success.

Mr. Simeon Baldwin.—Seth Green, of Mumford, Monroe county, N. Y., is well informed on this subject—he is regularly in the business and can be written to.

### EXCESSIVE USE OF PLASTER.

Mr. H. T. Baily, West Newberry, Mass., stated that about twenty-five years ago two-thirds of a ton of plaster was applied to the acre on a steep hill-side, which had never been plowed, and which produced little feed. The consequence was a heavy growth of white clover.

Prof. Nash said that it would require the rains of several years to make the plaster available.

### MERCER POTATOES.

Mr. Wm. Lawton.—I would like to make a few remarks on the Mercer potato. *Hazard's Register* says it originated in Mercer county, Pa., in 1833. Every plant has life of its own, and there never can be any change. No two are alike, and the peculiarities of each are carried on forever.

Dr. J. E. Snodgrass.—Nothing is more certain than that to manure potatoes has a tendency to produce rot, and to destroy the original flavor, if not the quality.

Mr. T. P. Quinn.—As a practical grower of potatoes, I will say that it will not pay to raise the Mercer. It never produces more than 150 bushels to the acre, while of the early Goodrich I have raised over 300 bushels. I can raise the Harison, at fifty cents a bushel, cheaper than I can the Mercer at one dollar and fifty cents.

Dr. Isaac P. Trimble.—In the best farming regions the Mercer is no longer grown. It has degenerated through using small seed, and some are going to restore it by planting large seed. Where marl can be had, the potato rot is to a great extent unknown.

### MONROE'S ROTARY HARROW.

Mr. H. Monroe, Rockland, Me., was invited to take the floor, to explain the merits of his rotary harrow, a small model of which he exhibited to the Club. The teeth of this harrow are secured in wooden arms, bolted together at the center. An iron circular way is bolted to the ends of the arms. The implement is drawn by a beam extending across the top of the frame; and the beam is secured by a loose bolt to the center of the frame. When the team is in motion, the harrow rotates round and round, in a horizontal direction. One side of the harrow is loaded with an iron wheel, which travels on the circular way, that is bolted to the ends of the arms. The iron wheel weighs some thirty pounds. The object of the wheel is to give increased weight to one side of the harrow. By making one side heavier than the other, the teeth on that side are pressed deeper into the ground than the teeth on the opposite side. Then, as the draft beam turns easily on a round and smooth bolt at the center, the harrow rotates as soon as the team is started. By changing the traveling wheel to the opposite side of the harrow, the implement will rotate in the opposite direction. By this means the forward teeth can be made to rotate on sod ground just plowed, in the direction to turn the furrow slices over more completely, or to turn them back again with the grass side up. It was suggested that a committee be designated to go and supervise the operation of this implement at some convenient time and place.

### FEEDING STRAW.

Mr. Lewis Lewis, Prospect, Oneida county, N. Y.—I think it is a good time to call the attention of farmers and dairymen to the proper mode of feeding coarse fodder and hay together. We may talk and write about feeding turnips, ruta-baga, mangel-wurzel and beets, but it remains a fact that in the dairy districts cows are kept over winter with hay, straw and other coarse fodder, and the question is how to feed hay and straw to cattle, and make them take hold of the straw, when it is laid before them, as well as the hay. I have seen some take trouble to mix the two, and I have known others to feed straw in the forepart of winter, but milch cows will get low and poor with it, and when hay and straw are mixed, they will pick out the hay and leave the straw; but my practice has been to feed hay in the morning or forepart of the day; give them all they will eat, and when they are put in the stable in the afternoon, I give straw, and they take right hold, and seem to say: "We got hay in the morning, all we wanted, and it is a long time to wait till to-morrow morning, and we might as well make up our minds and eat this straw, because we shall not get anything else." But if I give straw in the morning, they will eat as little as they can, and seem to say: "It will not be long till we come in after being out to water, and then we will get all the hay we want. What is the use of eating this straw?" So, by careful feeding, I have, these twelve years or more, fed out all the straw I had along with hay every day as long as it lasted, and made all answer, and kept a clean barnyard and manure heap, and with some meal I got my cows to come out in a good thriving condition in the spring.

### HOW TO BUILD A CORN-CRIB.

Mr. J. S. Keith, Newton, Pa.—I have one that has stood for twenty years, and has never had a rat, and but one mouse, in it to my knowledge. Posts ten or eleven feet long and eight inches square; mortise two feet from one end; for side and end sills, two-inch mortise, with tusk. Taper post from sill to the end by hewing off inside until the end is reduced to four inches in diameter, make smooth with draw-knife, and nail on tin smooth half way to the end, below the sill. Let sills be eight inches square; also, end-tie them and the rafter plates strong with moderate inter-ties. Brace well, and lath up and down with three-quarter inch lath; dovetail or countersink joists crosswise; lay the floor, and board up the ends with ungrooved boards; let each bent be twelve feet long, six feet wide at the sill, and seven and a half feet at plate, with fourteen feet floor, and if full to peak, it will hold two hundred and fifty bushels. I never had an ear to hurt on account of the great width. If preferred, lay the floor with lath or narrow boards, with room for ventilation. Each post should stand on stone, about three inches from the ground, and each stone have a foundation two feet square, and below the frost. Adjourned.

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## December 17, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### CRANBERRY CULTURE.

Mr. James Lynch, New York, inquired about the culture of cranberries—as to the risks in the production of crop, and what those risks are? He inquired, also, whether salt water will do for flooding.

Dr. Israel Jarvis.—Sand is very essential in the culture of cranberries. Any one who can prepare beds of sand, will be able to produce a bountiful crop of cranberries. The cranberry will flourish well on pure sand or pure muck. Cranberry vines require three principal substances for their luxuriant growth, which are sand, muck and water. Where those three things can be obtained, cranberries can be raised in satisfactory crops. Some persons think that the fruit is better as it is raised near salt water.

Mr. J. C. Thompson, gave some of his experience in the culture of cranberries, and stated that Prof. J. J. Mapes said, you can grow cranberries on dry land as well as on low land, if you dam up the water so as to flood the vines once a year. At a certain season of the year, the entire ground must be covered with water long enough to destroy the insects that lay their eggs in the vines. He had once been afflicted with cranberry on the brain; but now, he thought that, after having visited several sections of country to procure information on cranberry culture, all this fruit requires is, black swamp muck, mixed with sand, and so arranged that the land can be flooded at pleasure.

Mr. J. B. Lyman said, he had been to Jersey lately, in quest of information about cranberries, and his views coincided with Mr. Thompson's, already expressed. When vines are flooded in winter, he said, the water must be sufficiently deep to keep the ice above the vines. Cranberries can be raised as well in Minnesota as New Jersey, if the vines can be flooded.

Mr. P. T. Quinn.—Mr. Trowbridge, at Tom's River, N. J., will send a pamphlet, for a stamp, containing all the information required.

### DAPHNE ODORA.

Mr. J. S. Burgess, Glen Cove, L. I., showed a beautiful and rare plant, growing in a pot of earth, and now in full bloom, which he called the Daphne Odora. The blossoms were exceedingly fragrant, and it was said to be one of the choicest kinds of house plants.

Mr. Cavanach, florist, of Brooklyn, stated that this delicate plant will not flourish satisfactorily in an atmosphere of higher temperature than forty degrees.

### WHITE TURNIPS.

Mr. James McAllister, Carlisle, Pa., asks, if common white turnips are good for milch cows.

Mr. Thomas Cavanach.—As regards the feeding of white turnips to milch cows, several of my neighbors are dairymen who have been in the business for many years, and they say it never pays to buy turnips for feeding to milch cows. The ruta-baga, or large yellow turnip, is worth for such purposes, fifteen and twenty cents a bushel. But for the common white turnip they will not give five cents a bushel.

Mr. S. Edwards Todd.—When I was keeping a number of cows, I gave them half a bushel a day, and they did well on the diet. Their milk was abundant, and rich in cream. I always made yellow butter, although it is commonly thought good butter cannot be made on turnips.

Dr. Isaac P. Trimble.—One winter I had a great quantity of turnips, and fed them to my cows. A shrewd farmer told me to begin with a small quantity and give a few more every day. I did so, and found no ill effects in the flavor of the butter. I sprinkled them over with corn-meal and gave half a bushel a day.

### FLAX STRAW.

Mr. Alfred Young, Gustavus, Ohio.—I am glad the flax question is exciting interest in the Farmers' Club. Now, I will not sell flax straw for the price that the flax mills pay for it. I think it worth fully one-half as much as good hay for feeding milch cows, young cattle, and sheep. I have more than once been saved from buying hay by having flax straw on hand. I feed it alternately with hay; say hay in the morning, and flax straw at night. My stock has invariably improved upon it. I have never found a better way of harvesting flax than to mow it by hand, turning two swaths together, what is called "turning a double swath," and letting it lie until dry enough to thresh or stack, when it can be readily pitched upon a wagon.

### TAN-BARK AS MANURE.

Mr. James Morris, Pittston, Pa.—Is there any way to use refuse tan-bark as manure. A neighbor of mine has tried it without success.

Mr. J. M. Allen.—Put it on a dry clay soil, and plow it under. It acts as a mulch, and it will enliven the soil.

Mr. S. Edwards Todd.—Tan-bark is good to put in the stall or yard, if it is dry. My practice has been to spread it in the fall under cover to dry, then use it as a litter, when it will absorb large quantities of liquid manure. If used when wet, it is of no value. Adjourned.

## December 24, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### AGRICULTURE OF MARYLAND.

Dr. James Higgins was introduced to the Club. He said the operation of causes set in action by the late civil war had so impoverished the former landholders of that State, that a large portion of their lands were now in market, or soon would be. He described that State as affording a great variety of soils, and permitting a great variety of products, all of which were nearer to great and growing markets than farm products of any other State. The great cities of Baltimore, Washington, Philadelphia, and New York, are all within a few hours of thousands of acres that can to-day be bought for from ten to fifty dollars an acre—land so good that it will grow from ten to twenty bushels of wheat per acre, and from forty to fifty bushels of corn. Dr. Higgins spoke of the three general classes of land in Maryland—the slate lands in the mountains, the limestone region nearer the sea, and the lower or tide-water country on either shore of the Chesapeake Bay. With respect to fertilizers, he spoke of the marls of Maryland, and said after repeated analysis he was satisfied they were in general equal and superior to those of New Jersey. They have both the green sand and the shell marl. Some of these shell marls are very rich in potash and phosphoric acid. In places the variety of marls was such that a farmer who understands their use can make just such a soil as he wants; if he needs potash, he can get a marl that has fifteen per cent of it; if his land requires lime, magnesia or phosphoric acid, there are reservoirs of these fertilizing substances in the earth beneath his acres or near at hand. The lands of Anne Arundel county were described at some length; the light sandy soils with an out-crop, of good red clay, admirably adapted to vegetables and early fruits, the white oak soils capable of high development, and the West and South River lands, first among the first class lands of the State for productiveness and value. The farms of his county are not large, varying from three hundred to eight hundred acres. The light sandy soils of this county can be purchased at from five to thirty dollars, the white oak, at from ten to sixty, and the most valuable farms of South and West River at from sixty to a hundred and twenty.

A member of the Club here inquired if these prices were attached to improved lands with buildings and other improvements?

Dr. Higgins.—I thank the gentleman for the inquiry. Yes, the improvements are included. We have not generally built many barns in that part of Maryland, as our winters are mild, and we have found it best to thresh our wheat in the fields as soon as dry, without hauling and storing under shelter.

The Eastern Shore lands were also described as affording good fruit and vegetable farms, easy of access, and with ready transportation to the cities of Washington, Baltimore and Annapolis. These lands are now to be obtained at very low rates.

In summing up the advantages afforded by his State, Dr. Higgins said: We have a season two months longer than you of New York, so that eight full months are allowed by the climate for farm labors. We have a city population of more than two millions within a half a day's ride, who are certain to buy all the vegetables and fruits of all kinds we can raise, at high prices. We have a coast line of greater length than any other State of the size of Maryland, and free railroad transportation in all directions. The tone of society is good, the people kind, courteous and hospitable to each other and to strangers, so that honest, industrious persons from any portion of the Union will meet with a reception equal to their merits. We offer to the laborer, abundance of work, good wages and kind treatment; to men of small capital, a choice opportunity for the purchase of the best quality of land in almost any quantity, small or great, adapted to all kinds of staple crops, fruits and vegetables, with the speediest and cheapest transportation to market; to families willing to work, excellent opportunities for renting the best lands at low rates, the implements and stock being, in many cases, furnished by the landed proprietor.

Dr. J. E. Snodgrass.—I lived some years in Maryland, and I think Dr. Higgins, whom I know as an earnest man, that has done a great deal for agriculture in that State, is mistaken about two things. He says Northern men will be made welcome there. Now, I am satisfied there is a great deal left of that old intolerant prejudice against Yankees. I don't believe a Yankee farmer could go down there and marry the daughter of one of those old ex-slaveholders. Another thing, they ought not to get along without barns in Maryland. If they don't want them for shelter, they need them for the purpose of working over all the refuse straw, &c., into manure. Besides, those old landed proprietors are holding on to their lands—they don't mean to sell if they can help it.

Dr. Higgins.—If the gentleman will allow me, I have traveled for many years over the State, and know personally nearly all the families in it. I am sure I speak the sentiments of my people, when I say that no objection is made to Northern men as such. Of course, there is political sentiment and feeling engendered by the war, but they are not displayed unless discussion is sought by the Northern man. As to marrying, I am quite sure that the Yankee girls who go there are not long generally in finding husbands. The gentleman is certainly misinformed, if he thinks much of our land is not for sale. A few days ago I had a letter from one of our oldest counties, saying that almost all their lands were for sale, or soon would be.

The Chairman.—I am sure we are all very much pleased with the account Dr. Higgins has given us; no information could be more in point at the present, and I trust the gentlemen of the press will give publicity to the inducements to laborers, small capitalists, and energetic young men, offered by the State which Dr. Higgins represents. These thousands of unemployed men should know where they can obtain labor and land. The Chairman does not believe a special education is needed to make a successful farmer. Many a man has left the yardstick for the axe and hoe, and made more money than the old farmer at his side. As to their being rudely treated, I do not believe it. Let them only learn the meaning of those two words, *adaptation* and *tolerance*, and there will be no trouble of a social character. I hope that great numbers of our unemployed will see these remarks of Dr. Higgins, and leave our over-crowded cities for healthful, natural industry behind the plow.

### SUPERIOR SPECIMENS OF BEEF.

Mr. Thomas Godwin exhibited some cuts of beef steaks from one of ten bullocks fattened by Mr. Harvey Hicks, of Bourbon county, Ky., for Mr. T. Lawrence, of Center Market, New York city. The average weight of these steers was over sixteen hundred pounds, and they are said to be the best ten ever exhibited in Albany.

Mr. Godwin stated that Mr. Lawrence had also a great show of Southdown sheep, which were raised on the Central Park, all of which are fine specimens of mutton; he invited the Club to view the slaughtered animals.

These steaks were afterwards cooked at a neighboring restaurant, and served up to several members of the Club, who pronounced them of very superior quality.

### ANNEALING FENCE NAILS.

Mr. R. M. Welles, Towanda, Pa.—Fence nails when properly annealed, are doubled in value. How readily to anneal nails by the quantity is convenient to know. My method is: First, choose a smooth, hard spot of ground, at a safe distance from any neighboring building; there spread dry corncobs to the depth of six or eight inches, and over enough surface to allow of the nails being spread to a depth of one or two inches; cover the whole with another layer of corncobs, and set the fire in the windward side, The nails, when cooled, can readily be raked out of the ashes. Good dry hard wood chips or other small wood will answer in the absence of cobs.

### TO PRESERVE AUTUMN LEAVES.

A lady correspondent sends to the Club her method of preserving autumn leaves: Gather them when the colors are the brightest, and press them in a large book with a heavy weight changing them daily to a dry place in the book. When perfectly dry varnish both sides of the leaves; white varnish is the best. In arranging them into wreaths and bouquets, use cedar for back ground, which must also be pressed and varnished.

### TO CRYSTALIZE GRASSES.

Put a pound of alum into a tin basin and pour on a quart of soft boiling water, set it on the stove until the alum is dissolved, then let it cool to about 100 degrees; put in your grasses and let them remain an hour or two; the bearded grasses and coarser grasses require less time than the finer grasses. If they remain too long the crystals will form too large. When the solution becomes cold the alum will settle to the bottom of the basin and will need to be heated over to the boiling point. If a variety is desired: for blue dissolve a small lump of the extract of indigo and add to the solution; for red, use carmeri. A bouquet of crystalized grasses, with a few everlasting flowers arranged on gilt paper and framed in a dark frame, is beautiful. They can be fastened on the paper with thin glue.

### TRANSPLANTING FOREST TREES.

Mr. J. Latshaw, Cedarville, Stephenson county, Ill.—Shortly before cold, freezing weather sets in, I take my tools and wagon, with as much coarse horse manure with me as I think I may need, select and dig round my tree, letting from one to two and a half feet of ground stand all round the tree—small trees need but little, large ones more. Dig a trench straight down some ten or twelve inches, then undermine the tree to the extent of one half of the block of ground, and in digging under keep digging down so as to have the ground at the tree near the shape of the half of an egg. Now fill this trench about three parts full of the horse manure. Next take the measure of the diameter of the tree's base, then dig holes sufficiently large for all the trees so prepared; fill these also with manure, but be sure to leave some good mellow ground in the hole to use when planting. Next, when frozen and there is a solid ball, we then throw out the manure, then with strong lever pry out the tree, roll it upon a sled or truck, convey to the already dug hole, clean out the manure and some unfrozen ground, slide in the tree, fill up tight. I have never had one tree to miss growing when thus planted. It is no easy matter to dig a large hole in the ground when the same is frozen to the depth of three feet.

### A NEW STUMP MACHINE.

Mr. A. Crawford, Warren, Me., exhibited and explained a small model of a powerful hand stump machine and rock lifter, with which one man can lift a rock weighing ten tons, or extract a stump requiring the exercise of a mechanical power capable of elevating 20,000 pounds. This machine is operated by means of a horizontal lever with a man or two at each end. A ratchet wheel of peculiar shape on a small journal bearing a pulley, is made to revolve slowly by the motion of the lever, up and down. The chain that is hitched to the stump or rock, is wound up by the pulleys; and thus the weight is lifted bodily. The machine is suspended on a strong tripod set up over the weight. Iron rods extend from leg to leg, to keep the shears in position, when it is being moved from stump to stump. The members liked every part of this machine but the price, which they thought quite too exorbitant. Adjourned.

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## December 31, 1867.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### CLOSING OF THE YEAR.

The Chairman spoke of the closing of the year. During the period which has passed, many promises undoubtedly were made, but I fear that most of them were broken. The object should be to make ourselves useful. To do so, we must make a few wise resolutions, and wisely keep them. To make ourselves better, only can be done by helping to make others happy. Our privileges are great. It seems to me, when looking back on the past year, that an unusual number of those who have been associated with us have passed away. The opportunity which is presented to us, and the work which is allotted to us to perform, is to add to the comforts and conveniences of life; to abbreviate toil, and to elevate the standard of industry. I am happy to say that the influence of our Club is extending more and more; and that within our sphere we have most decidedly progressed during the year which is past and gone. So important have our meetings become, that the managers of the Metropolitan press, who are noted for their sagacity, are, one after another, giving more space to the reports of our proceedings; and I am happy to say that those papers recently reporting us, do so with all the fairness we can ask. In view of these and other considerations, we should not relax our efforts to disseminate useful information.

Mr. J. B. Lyman.—I fully appreciate and coincide with the remarks that have been offered. The position of this Club is central. The lines of communication and influence radiate from this city to every part of the country, and to other nations. The discussions of this Club have acquired a national interest. He thought the proceedings might be largely increased in value to those who read the reports for instruction, if each member would take up some subject which he understands, and read a paper that would be instructive, edifying, and worthy of publication.

### HORSE FEED—FARM MACHINERY.

Mr. T. C. Buckmaster, Newburgh, Orange county, N. Y.—As the season for stabling and feeding animals has arrived, and as all kinds of feed are extremely high, I think a few suggestions thrown out by various members of your Club would be of great service to many. As to feed for horses kept constantly at hard work—what do you regard as the best; rye, corn or barley?

Mr. E. Williams.—A good feed is a mixture of corn and rye. Corn is chewed best when fed on the cob, In some parts of the season farmers have not time to go to the mill, and much corn is fed as it comes from the field.

Mr. J. M. Allen.—The soft corn of the West is as easy to eat as oats, and it is altogether a different article from the flint corn of the East.

Dr. F. M. Hexamer.—The city railroad companies here have made more experiments than any farmer can make. They buy western corn, which is ground. Then thin hay is cut, and they feed fifteen pounds of each a day, which is mixed dry, and then moistened with either hot or cold water.

Mr. J. C. Thompson.—Each establishment grinds its own corn and cuts its hay by machinery. Men are employed for the purpose of thoroughly mixing the feed, and the horses have nothing to do but to eat quickly, by which means much time is saved.

### TOP DRESSING WHEAT.

Mr. G. Hill, Lyme, Conn., inquired whether it will answer to manure a field sowed with wheat last fall, and whether ashes or stable manure would be best.

Mr. N. C. Meeker.—A covering of stable manure would do no harm if put on when the ground is frozen. The Germans in many parts of Missouri excel in growing wheat, by mulching the ground with straw in the fall, before the wheat comes up.

### DAMP IN WELLS.

Mr. W. R. Waldron, Webster, Mich.—I have a well in my barnyard, thirty-two feet deep, water always about thirty inches. I use a pump, and water stock daily. Now, this well is generally filled with the damps, or foul air as it is called, and a man can never go down it with safety until it is got out, and this is always a tedious job. I have tried various ways, such as slacking lime in it, pouring in water, letting down live coals, passing bags filled with straw up and down rapidly, and tying green bushes together and doing the same with them. This last, seems to be the best, but this I think is too slow, usually requiring several hours' work. I think there must be a better way. What is the cause of damp in wells?

Mr. S. E. Todd suggested that a large box tube, two feet square, extending to the bottom of the well, might be connected with a large wooden force pump, which any good mechanic can make, and fresh air could thus be forced down to the bottom of the well, so as to drive out every particle of foul air in a few minutes, at a trfling expense.

### VENTILATION OF BUILDINGS.

The same writer who proposed the foregoing question, asked, if it is true that carbonic acid gas falls to the lower part of the room, why ventilators are commonly placed nearer the top than the bottom of the side walls of a building? Why not have ventilators near the floor, so that the carbonic acid gas can escape through them?

Dr. F. M. Hexamer.—There is no free carbonic acid gas in the atmosphere. It is true, that this gas is heavier than atmospheric air, when pure; but it soon mingles with the air. When it is formed by the respiration of animals, in a close room, the foul air within being warmer than the cold air outside of the walls, it rises, and its place is supplied by pure air that rushes in through the crevices around the doors and windows to supply the place of this impure air. For this reason, openings are formed near the upper part of the rooms to allow the impure air to escape.

Dr. J. E. Snodgrass alluded to the improved mode of ventilating rooms by means of windows that will move downward from the top of the frame. He thought ventilation was not sufficiently attended to, and he especially deprecated admission of air in small jets and from the middle or lower part of the room. He said air should come in from the top windows. If the sashes are fast, let them be arranged so as be let down from the top.

Mr. N. C. Meeker read the following valuable article, by an English writer, on lime, from the *Mark Lane Express:*

### LIME—ITS USES IN AGRICULTURE AND MODES OF APPLICATION.

Lime, viewed as a manurial element, is one of the most valuable and important mineral substances with which the agriculturists of the present day are acquainted. By its uses, even in very limited quantities, waste land in process of reclamation is quickly brought into a state which renders it capable of bearing profitable crops; the coarse vegetation which generally covers such land, and uselessly occupies the soil, being speedily decomposed, and the elements of fertility thereby imparted. It is not, however, to waste land alone that the application of lime is valuable, as it can with great propriety be used upon land in a high state of cultivation, with highly beneficial results; in fact, the bulk of the lime used in agriculture is applied to land long in cultivation, and worked in the usual rotation common to each district. On heavy clays, adhesive and difficult to work, lime pays for its occasional application by the mere mechanical influence exercised on such soils. By the action of quicklime, the most stubborn soils become disentegrated, and consequently easy to work; the saving of labor alone in many cases paying for the first cost of the lime.

In liming land, the practice of farmers has greatly altered of late years; as, instead of a heavy dressing at long intervals, which formerly was prevalent, smaller quantities, at intervals of from six to ten years, according to the rotation followed, is the most popular method of applying lime at the present day. This stands to reason, as, apart from its mechanical action (the great use of lime being to liberate and utilize the inert organic matters contained in the soil, and so enable it to enter into new combinations), too heavy a dressing exhausts this ingredient too suddenly, and, instead of benefiting the land, such an application materially injures it for several successive seasons. Light land will, of course, sustain much greater injury from an excessive dose of lime than heavy clays or coarse lands, and be much longer in recovering from the effects of an overdose. Land in good manurial condition, which has not received an application of lime for many years, is greatly benefited thereby; and its effects are so rapid and striking, that many farmers have been induced to continue its application until the fertility of their soil was almost—nay, in fact, completely—exhausted. A farmer who uses lime in considerable quantities, without recruiting the exhausted energies of his land with a proportionate supply of manure, may make a decent living, possibly, for some years; but if he himself should escape the consequences of such scourging husbandry, those who succeed him can scarcely hope to do so, as there is much forcible truth in the old couplet:

"He who limes without manure,
Will leave his farm and family poor."

One special recommendatory feature to the use of lime in agriculture is its portability—this being more particularly the case when the situation permits of its being drawn from the kiln in a state of quicklime, or, more familiarly, lime-shells. It can be carried with comparative ease to great elevations, where the conveyance of farm-yard manure, in any appreciable quantity, would be simply impracticable; and, under its sweetening influence, heath, moss and bent-grass soon disappear, and become an active and abundant source of nourishment to the cultivated grasses or other crops, if the situation permits of their cultivation. On reclaimed moorland, powdery lime acts much more quickly in reducing the coarse vegetable matters to a state by which the after-crops can be benefited, than when used after it has become mild. In Scotland we have seen land broken up, and, by the application of lime alone, grow the cultivated grasses in extraordinary luxuriance, where previously nothing was to be seen but an unbroken waste of heather, wonderfully beautiful, certainly, in autumn, when in full flower; but practically valueless, and the abode of the mountain hare, roe-deer, fox, and other animals. This particular piece of mountain was broken up in 1850, and torn to pieces, by repeated plowings, as minutely as the state of the soil would admit, and then left rough for the ameliorating influence of the frosts of winter. The following spring operations were resumed as soon as the weather would permit; and, after another plowing and the removal of stones and other incumbrances to successful tillage, lime was liberally applied and worked in, and the land left for a short time to rest, previous to its being sown with grass-seeds. This, owing to the extent of the numerous operations that had to be carried out, could not be accomplished until June; yet, notwithstanding the comparative lateness of the season, by the end of August, or beginning of September, the young grasses were so thick and luxuriant, that a large stock of half-bred Leicester sheep, five to the acre, were placed upon it, and were sustained thereon until finished for the butcher. This is probably an exceptional case; the soil, although on the top of a hill, or almost mountain, being deep and naturally fertile, requiring only the outlay of a few pounds per acre in labor and lime to make it productive; but, notwithstanding, much land that is still unreclaimed, or only partially so, is capable of extraordinary improvement by a judicious, yet moderate expenditure of capital in lime and labor. It is evident that, without lime, much of the reclaimed land on elevated situations must have still remained in a state of nature, from the great difficulty of getting bulky materials placed upon the land, not to take into consideration the inability of any kind of organic manure to take the place of lime in quickly decomposing and rendering active the useless vegetable matters which originally had possession of the surface. To be sure, in the absence of lime, paring and burning is a very effectual method of getting rid of the roots of heath, rushes and other obstructions present on land in a state of nature; and, when worked up, portable manures can be very successfully used as fertilizers. By their use turnips can be raised, if the situation admits of their cultivation, and, being eaten off with sheep, the land is thus well prepared for the reception of the grass-seeds. Elevated land, however, is seldom possessed of such depth of soil as to be able to spare any of it for the process of paring and burning, which is at best an exhaustive operation, and should never be attempted unless there is sufficient depth of soil to warrant its being done without permanently, or at least for many years, injuring the soil by destroying its resources.

The carriage of lime by railway has of late years conferred a great benefit on the enterprising agriculturist, as by this means lime for manurial purposes has been carried into districts where previously the expense of carriage amounted to actual prohibition. By rail it can be conveyed away immediately on being drawn from the kiln, and the land can thus have the application of quick lime. When a farmer can only avail himself of water-carriage to bring lime within easy calling distance of his farm, he must be content with it in its slacked or mild state, which puts him to a double disadvantage, as the application is not so beneficial, and the carting from the increased bulk is doubly laborious. The directors of most railways very properly give every facility for the conveyance of such bulky articles as lime and dung, and take them at very cheap rates. We are aware of lime-shells being carried twenty-four miles at about tenpence a ton, which charge is a very marvel of cheapness, and offers great encouragement to the farmers in the districts traversed to use it, which they do, and with excellent results, as must always be the case (save with certain exceptions) when applied to land, which, from its distance from limestone, has never had an opportunity of being overdone, or even of having had a moderate dressing.

In applying lime, there is often considerable difficulty in managing successfully, should the weather break and continue obstinately broken for a lengthened period, as after becoming soaked the land cannot be carted on without injury, and the lime itself is extremely apt to run into mortar, and so be rendered useless. That the land may have the full benefit of the application, plenty of assistance ought to be kept at it until completed, the lime being worked in as soon as spread, as it soon loses its causticity when exposed to the atmospheric influence. On farms, the soil of which is so heavy as to preclude altogether, or in a great measure, the growth of turnips and other green crops, and so necessitate a continuance in the old system of periodical fallows, that period of the rotation at which the bare fallow occurs is obviously the best for the application of lime; and during the summer or autumn, previous to the wheat seeding time, the lime may be applied. If applied fresh from the kiln, sufficient time must be allowed to permit of its being cooled before the land is seeded, otherwise a portion of the seed may be lost by coming in contact with the hot lime. On light land, worked on the four, five or six course of rotation, the months of September and October, or just immediately after the removal of the corn to the stock-yard, is a very convenient season to lay on lime. On those soils on which the turnip crop is improved by a dressing of lime, it should be put on immediately after the fields are cleared of the preceding corn crop. No period of the year affords a better opportunity for liming than this, as there is, first, a long day, admitting of a full day's work being done—a matter of the utmost importance when a large staff of men and horses is employed; and second, the lime can be admirably mixed with the soil by the usual course of autumn culture, which the fields would have got independently of the lime being put on at that time. The grubber is probably the most perfect implement at the command of the farmer for thoroughly incorporating lime with the soil; and it is also at the same time the safest, as by the action of the grubber the powdery particles of the lime are mixed with the surface soil, not buried under it, as is too apt to be the case when turned in by the plow. In this way the well-known tendency of lime to sink is in a great measure counteracted; the soil, and through it the farmer himself, getting the full benefit of the application. In grubbing-in lime, the ordinary grubbing-shares are better than the broad or duck-footed, as the earth can be worked to a greater depth with less labor to the horses; and, indeed, the operation of cleaning the stubbles is quite as well performed by the ordinary shares, unless in exceptional cases, when passed over the fields laterally and longitudinally. When well grubbed-in, the autumn plowing may then with all safety be performed, as deep, too, as the capabilities of the soil will permit, without the slightest danger of burying the lime too deep, and losing thereby most of its good effects. Most soils resting on the old red sandstone can be safely treated with lime when in preparation for turnips or any other green crops, providing it has been laid on and incorporated with the soil sufficiently long to render the caustic principle of the lime innocuous. On heavy soils, or those of a boggy nature, there is comparatively little danger, as the heat is much sooner absorbed; and every year lime may be seen put on such soils in April and May, worked in immediately with plow, harrow or grubber, and the seed thereafter sown, without sustaining the slightest injnry. When the land has lain in grass for a considerable time previous to having been broken up for the preceding corn crop, and consequently contains a large amount of organic remains—otherwise decaying vegetable matter—the application of lime to the green crop is productive of the happiest results. In the half-decayed turf it has something to act upon, which it quickly does, rendering it soluble and subservient to the nourishment and rapid and healthy growth of the young plants. In such a case as this, lime takes the place of the portable manures, and, when the ordinary quantity of dung in used in conjunction with it, a capital crop of turnips is the result. In any case it will seldom be found advantageous to use caustic lime, and guano, or any of the dissolved bone manures for the same crop, as the lime, particularly if recent, will be sure to have the effect of neutralizing the action of the other fertilizers, rendering their application useless, and the money spent in purchasing them a total loss. When a farmer has a field such as has now been supposed, he is often tempted, should his agreement allow him or his landlord give permission, to repeat the corn crop, which, although it may make a good many pounds per acre for that particular season, is mostly in the end injurious to the land and a loss to the farmer. A much better plan, and one quite consistent with the most stringent rules of good husbandry, is to lime on the severance of the first corn crop, work well in, and the following season drill and put in turnips, which will, all other contingencies being favorable, be a first rate crop; the rich mold formed by the action of the lime on the fibrous mass of the half-decayed turf being amply sufficient to grow a full crop. On limestone land, however, and limestone gravels, attempting to grow turnips in this way is highly dangerous, and almost certain to result in total failure; and we would on no account have it supposed that we recommend the use of lime on such soils for the growth of green crops, either in the mode here described or in any other way whatever. Experience and observation both teach that on those soils there is already as much calcareous matter as can be assimilated by the turnip plant, and consequently any further addition to the supply already possessed by the soil can only act as poisons do in the animal system—either by destroying vitality altogether, or injuring it so seriously as to render the plant incapable of maturing a healthy and consequently profitable crop.

In liming land, previous to laying it down to grass, if it has not been done for the green crop, the proper time for doing so, and, in fact, the only time in which it can be done, is obviously the winter and spring, according as the green crop is removed, and also according as the weather affords favorable opportunity. If there is much to be done, the weather must be carefully studied, and no opportunity lost, as poaching the land at this late period of the season is especially injurious, more particulary as it has no chance of recovering itself from the effects of such injury between that and seed time. Frosty weather of some continuance affords a capital opportunity for winter liming—the hard roads materially lessening the labor on the horses, and the carts passing over the land without in the slightest degree injuring it.

From our own experience, we believe that there is no mode of applying lime to the land so perceptible for good, and so lasting in its effects, as just previous to its being laid down. What between harrowing, grubbing and plowing, it gets so thoroughly incorporated with the surface of the soil, that its tendency to sink is, in a great measure, counteracted; and we have found that the nearer to seed time it can be applied, the greater benefit does the crop derive from it, and the dressing need not be so large as when given previously. Some judgment must, however, be exercised when laying on caustic lime at such an advanced period of the spring, as, if not well mixed, a considerable portion of the seed may get scorched, and the braird will be consequently patchy and unequal. On very thin soils, such a contingency is almost unavoidable, and it is better to lay on the lime sufficiently early so as to obviate all danger from its causticity.

Of late years, the potato disease has been very erratic, entire districts having been passed over without much injury, while others, with as much apparent reason for exemption, have suffered so much as scarcely to be worth the trouble of digging. This we attribute more to atmospheric causes than to anything connected with the treatment or culture of the land. Every cultivator must, therefore, take chance for the results, it being scarcely possible for any one to ward off disease; and we, therefore, look upon lime or lime composts as being a good thing to use in preparation for potatoes, without attributing to them any curative or preventive property whatsoever.

As an inexpensive, and at the same time telling improvement on grass lands, composts of lime and earth stand conspicuous; and the good effect of their application is readily recognized, being both immediate and permanent. As an easier mode of applying lime, many farmers lay out the shells in small heaps on the grass, just as they come from the kiln, spreading evenly over the surface when dissolved by the action of the weather. Lime thus placed upon pastures certainly has a revivifying effect upon the grasses of which they are composed, killing moss and other useless plants which frequently threaten to take possession of the land to the exclusion of the more valuable herbage, and the application has the merit of being a cheap one. The effect of this dressing, however, is not nearly so lasting as when the same amount of lime is applied in compost; nor is the improvement so apparent. During the past season, we have seen hay to the weight of at least two tons per acre cut from a field which we never before saw meadowed, for the simple reason that it would not have paid for the trouble had hay been attempted to be taken off it; and the after-grass came thick, strong, and as green as a leak, immediately on the hay being cleared off. This improvement was effected solely through the agency of a liberal dressing of lime compost, which was laid on during the spring, just previous to the commencement of the growing season. The compost consisted of the sediment that was taken out of a large pond for several seasons, mixed with as much quicklime as imparted a heat to the entire mass. This sediment was a manure of itself, and, even without mixing with the lime, it probably formed one of the best dressings that could be placed on pasture land.

To insure regularity and evenness in spreading, and to make absolutely certain that no portion of the field shall get more than another, it is well worth while sending a man with a horse and small seeding plow to mark the field into squares, previous to the lime being brought; he will mark from ten to fifteen acres a day, according to the distance considered most suitable; and the satisfaction of having it regularly laid on, and that without the slightest trouble, will more than doubly compensate for the time occupied in marking it off. After repeated trials, we find twenty-five feet to be a very convenient distance for laying down, as the men in spreading have no difficulty in throwing it out twelve and a half feet, and scarcely require to shift their position to do so. The number of heaps required for a statute acre at this distance is seventy, and the quantity to be given per acre, whether more or less, can be easily apportioned by making a greater or less number of heaps of each load, as the shells are being placed on the land. Supposing the quantity intended to be given per acre to be four and a half tons—which is a very fair dressing on light friable soils—the number of loads required will be six, of fifteen hundred weight each. Each load thrown out on the land in twelve little heaps gives seventy-two, which brings the weight of shells per acre just as near the required quantity as there is any occasion for, a hundred weight more or less making no difference, and exercising no perceptible effect on such a large area as 4,840 square yards. If a larger dressing is intended, the number of falls to each load can, of course, be lessened; and if smaller, correspondingly increased; the quantity laid on being thus simply managed, without any interference with the original marking. When placed upon the land, the shells should at once be trimmed nicely together, and the heaps balanced or equalized by taking a few stones from these heaps that appear to be rather large, and placing them on those that are small, so as to insure uniformity in spreading, as in the hurry of drawing them from the carts it is nearly impossible to have the falls equal. This being done satisfactorily, the lime can at once be mixed with a few shovelfuls of damp earth, and a sprinkling thrown over the top of the heaps, sufficient to cover the lime, and no more. To insure immediate slacking, care must be taken, not only to cover, but mix the lime with the earth; otherwise about a week will elapse before anything can be done in the way of spreading. When well mixed, in an hour, or even less if the soil is very damp, a strong heat will be evolved, and every heap will commence steaming like miniature kilns. In a few hours the steam ceases, and on inspection the shells will be found to have burst, and in a great measure crumbled down into fine powder. The heaps, which will by this time be three times their original size, may now be stirred up with the shovel, the covering of earth and the lime being well mixed together, so as to completely dissolve the pieces which had not previously been thoroughly reduced. In four or five hours the lime will be fit to spread, and thus it can with all ease be slacked, spread, and worked in within twenty-four hours of its being drawn from the kiln. By attending to it, with sufficient hands to do it thus quickly, the lime is not permitted to lie long enough to burn the soil; there is almost no danger from injury by the weather, as there is only one day's drawing ahead of the plow or grubber which is working in it, and the soil gets the full advantage of a dressing of lime in a really caustic state—a difficult matter to be obtained and exceedingly problematical under any other mode of management. Considering the value of lime when applied to land freshly broken up, or in good manurial condition, it is by no means expensive, unless the district is very inconveniently situated for carriage by water or rail, or even by the ordinary cart. Taking the average price of a ton of lime and cost of carriage to be ten shillings, a dressing of five tons to the statute acre can be given for about three pounds, leaving an ample margin for mixing and spreading. If applied so frequently as every six years, four tons would be quite enough on light land, while heavy clay soils would take six, and suffer no injury; but, on the contrary, be very much benefited by the application. He who does his utmost to treat his land well, by cleaning properly, manuring liberally, and liming judiciously, not only deserves success, but mostly attains to it, good treatment of the land being the surest road to material prosperity. Adjourned.

## January 7, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### MANAGEMENT OF APPLE ORCHARDS.

Mr. W. P. Gates, Windham, Conn.—I have an orchard of about one thousand trees, which were planted some twelve or fourteen years ago, yet they have produced but little fruit. The orchard is on high ground, which is natural for grass, and a part of it is well sheltered from the northwest and northeast winds. The trees which are the most exposed produce the most fruit. Will pasturing sheep, or sowing plaster, help it? Or would bone dust or lime be better?

Dr. Sylvester.—When there is a scarcity of grass, as in hot weather, sheep will bark the trees. Hogs and lime are much better for an orchard than either sheep or plaster. The hogs will root in the soil, which will be of more benefit than plowing. The trees should be frequently washed with strong soap suds, to prevent their becoming hide bound.

Dr. Isaac P. Trimble.—This question is of much importance, as the apple crop has been almost a total failure this year in New Jersey. We have enough orchards in our State to more than supply ourselves. Land for crops will degenerate as well as for apples, if not cultivated. Those that are well attended to, do well. It is of much importance that the ground be pastured with horses and hogs, so that the insects in the immature fruit may be destroyed. A plenty of apples are to be had out West. I do not believe that apples have degenerated at all; the trouble all comes from carelessness.

Dr. Horatio D. Shepherd.—I don't believe very much in hog plowing; but I have read somewhere that coal tar is good to keep insects away from the apple trees, and in one case I knew of its being tried with success.

Dr. Isaac P. Trimble.—We do not wish to give out as a Club that, in our opinion, coal tar does apple trees any good. Why should it? The insects hostile to the apple tree come on the wing, and coal tar daubed on the trunk will have no effect. If we want apples we must cultivate for them and fertilize for them.

Mr. Thomas Cavanach.—If any one wants to kill his trees let him use petroleum; yet it is beneficial in a diluted state, applied to shrubs and plants to keep off insects, but it is death when applied to the roots. I knew a line of shade trees on an avenue that were treated with coal tar to keep the goats from biting them. At first they looked as though they would all die, but now their appearance is healthful.

Mr. J. B. Lyman.—In the first place, Mr. Gates, you do not want the same manure that you require on grain, for apples consume little or no nitrogen. But you want substances rich in lime, in potash and having some sulphuric acid and some phosphorus. Plow the whole orchard thoroughly, as well close to the trees as a foot or two distant, harrow, fine and smooth, and under the trees sow ashes and plaster, and half a bushel of lime to each tree. Harrow this in and around the roots for a space as large as the shadow at noon covers; put rotten straw, dead weeds, sawdust, tanbark, anything that will keep the surface soft and moist. Try this on fifty trees first, at the same time trimming off dead limbs and suckers, and if it does no good, then the climate is against the Connecticut apple orchards. Call to mind the parable of the barren fig tree.

Mr. Sylvester.—In Western New York we have a splendid crop of apples. The region seems to begin with the western line of Wayne county, and extends to the Niagara river. The following item, from one of our papers, will give some idea of the importance this crop has assumed:

"Mr. S. W. Smith, the energetic secretary of the Orleans County Agricultural Society, gives the number of barrels of apples shipped East the past season from that county, as 181,999, of which 71,000 barrels were shipped to New York, 46,000 to Boston, 33,000 to Philadelphia, and 6,000 to Providence. The average price per barrel was $3.06, making the snug little sum to the farmers of that small county, for apples alone, of $556,917.94. There are, probably, 50,000 barrels reserved in the county for home consumption and spring sales, which will make the crop worth three-quarters of a million dollars."

### CELERY.

Mr. T. C. Corbit, Penn's Grove, N. J.—What kind of soil is best adapted to celery? How should it be planted, and how much ought to be raised from an acre?

Mr. John Crane.—I refer him to Henderson's work on gardening, whence may be obtained all the information required.

Mr. Thomas Cavanach.—We commence setting our plants the last week in June, on Long Island, and manure with refuse garden manure, put in a trench and watered with house-slops. The plants are set six inches deep in the trenches, which are at first about fifteen inches deep, but afterward are newly filled with rich soil.

Dr. J. M. Crowell.—Decomposed hair is a special manure for celery.

Mr. Sylvester.—The best manure I have ever used is bones dissolved in sulphuric acid, mixed with loam, and applied at the bottom of the trenches.

Mr. Wm. B. Peck.—Farmers might easily crush all their own bones. Let them take an old kettle, such as a potash or sugar caldron, and set it in the ground. Then make a pestle of stone, or use a cannon ball suspended by a chain and attached to two hickory poles, so as to spring a short distance. Two boys can work this, and crush into powder a good many bushels of bone in a day. A better article of bone meal is thus obtained than going to mills for it.

Mr. G. W. Buck, Ellicottville, N. Y.—I am a great hand for experimenting, and had rather know a thing by experience, than from the best man's "say so." I am a native of this town, but three years ago I moved to Caroline county, Md., bought an old worn-out farm, and have since been puzzling my wits to bring it back to its original fertility. Manure was not to be had, and it was too poor to produce clover; so I had to use something else. I have tried many experiments, among them the dissolving of bones, of which there is a bountiful supply left of old carcasses fed to the buzzards. I gathered some of them, and tried dissolving them in different ways. The cheapest and easiest way I found was, to take a deep box, barrel or hogshead (the latter I like the best), cover the bottom about two inches deep with ashes and lime mixed, about one part lime to two of ashes; the lime should be newly slacked, and mixed with the ashes, both dry; then put in a layer of bones, then two or three inches of the lime and ashes again; fill up in this way to about eight inches of the top; then fill out with clear ashes, or the compound, and then wet it gradually until it is thoroughly saturated, but not so as to drain; let it stand at least six months; the longer the better; when wanted for use, take it out, fork it over and pick out all the bones that are not soft, and save them for the next batch, and then pulverize and mix the ingredients well together, and you will find it one of the strongest and best fertilizers in use.

Mr. S. Edwards Todd read the following paper on farm buildings:

### THEIR LOCATION.

The first and most important consideration connected with the erection of farm buildings of any description, is the location. If the surface of the land is one continuous plain, there will be very little choice in the locality for dwelling-house, grain-barn, hennery, piggery or any other buildings. But when the surface is hilly or gently undulating, location is everything. There are many considerations of a pecuniary character, which should be allowed to have their proper influence when one is making a choice of a location for his buildings. If the location be on the slope of a lake or the bank of a river, or if nothing but a bubbling brook—the source of which is a mountain spring—meanders through the forests or green fields, the location of buildings should be chosen with reference to the water, both for considerations of beauty in laying out the grounds, and utility of convenience, incident to the eminent advantages of a stream of water. If practicably not too inconvenient, let the location for farm buildings be chosen where water may be conveyed in tubes to points round about buildings, for stock and other purposes.

Another point of transcendent importance is choosing a location near the center of the farm. The usual custom is to squat every building as near the borders of the highway as the law will allow them to be placed, without any regard whatever to consequences of access to distant fields. The custom of locating farm buildings along the highway has become so prevalent all over the country, that very few people have sufficient pluck to strike out a beautiful serpentine drive to the centre of their land, and choose a location for buildings.

Hon. Horace Greeley has furnished one of the most striking and illustrious examples on this subject. A narrow carriage-way leads from the main road along the hillside through the wild old woods, more than half a mile, to the middle of a woods where the dwelling-house is surrounded, on every side, by old and towering denizens of the forest. During the growing season, the music of the waving trees, and the delightful shade, render such a location doubly attractive; and in winter, when chilling winds and pelting storms sweep furiously by, the surrounding trees break the force of the cold winds, and thus render a home and its surroundings far more comfortable and pleasant than if the dwelling were standing in a bleak locality. Aside from the beauty of a residence among the trees of the woods, there is a wonderful economy in the growing trees that stand round about dwelling-houses and out-buildings, in the protection afforded to fruit trees and winter grain. The farmers of our entire country have made a most lamentable mistake in removing all the old forest trees that stood on that side of the farm whence came the prevailing winds in winter. Every young man, and old one, too, who contemplates choosing a location for farm buildings, ought to spare the trees round the dwellings and out-buildings. Plant your buildings, if the land be level, near the center of your farm, and let a dense belt of trees, a few rods wide, encircle them. Then let another belt of timber, a few rods in width, continue to grow round about the outside of the entire farm. More grain, grass, fruit or any other product of the land can be grown on seventy-five acres, with twenty-five covered with heavy forest trees, than can be produced on one hundred acres denuded of trees, and exposed to the sweeping winds of the winter months.

It appears odd to live a hundred rods from the beaten track of the highway, because a prevailing custom, which stands directly in the face and eyes of convenience, prompts people to locate their dwelling-houses where every itinerant interloper that travels the streets, by rising on tip-toe, may peep into the parlor or bedroom windows. People often think it is inconvenient "to live away off in the fields," because, when they go to church, to mill, to post-office, or anywhere else, they must travel so far before they reach the highway.

Now, we will suppose, for example, that it is a hundred rods from the further side of a farm to a highway—which will be attended with the most convenience and economy, to locate the buildings near the center of the farm, and thus save an untold amount of carting manure to the field, and products of the farm to the barn, and spend a few minutes longer in riding from the house to the highway, or to cart a large proportion of heavy materials one hundred rods?

There is no need of going into details on this point. The simple suggestion will be sufficient to induce a thinking farmer to put in practice what has been alluded to.

We have seen farms half a mile or more long, of a triangular form, with all the buildings on one corner. It is easy to calculate how much more time is consumed, and how much more team labor is required to perform the necessary carting on those farms than if the buildings were located near the middle of the entire tract. In numerous instances, dwelling-house, barn and all other buildings, are located so unsatisfactorily that it would pay well to have everything moved to a more convenient and desirable location. Farmers, as a general rule, have too little regard for location.

### THE FOUNDATION OF BUILDINGS.

The durability of any building will be greatly enhanced by means of an excellent foundation. It is unwise policy to rest a building on a foundation that will yield in a few years. In many localities the earth is so soft that a cellar may be sunk to any desired depth with a shovel. When heavy buildings are erected on such ground, there is much danger that some corner may settle, to the serious injury of the edifice. Boards or planking are frequently laid on the ground beneath the foundation wall. But such a practice cannot be denounced in too strong language, as boards, in such places, so favorable to speedy decay, will soon lose their solidity, and thus allow the wall and a portion of the superstructure to settle. The true way to prepare a foundation in such places is to excavate the dirt, say six inches lower than the bottom of the cellar, and three or more feet wide, stamp the earth thoroughly with a rammer, and lay thick flagging stones on the bottom, resting on a bed of cement. Such a foundation will not be expensive, and it will remain intact for ages after the men who built the wall have been forgotten. If the land is at all springy, let drain tiles be laid entirely around the outside of the foundation, to catch and conduct away the excess of moisture that would render the cellar or basement of the building undesirably damp. A few dollars expended in a proper manner, and at the correct period, will not fail sometimes to enhance the value of a building or cellar more than a hundred dollars. A poor foundation beneath a fine superstructure is often a source of grief that a few dollars can never mitigate. And let me urge, at this point, the importance of preparing a permanent foundation for every barn and other out-building. If the country affords no other material than bricks, miles away, lay a firm foundation, if the superstructure is to be nothing but a hennery or piggery. And let the bottom stones, or bricks, be placed so far in the earth that frost will never disturb them. When the earth freezes and thaws beneath a wall for a few successive winters, some part of the building will most assuredly be thrown from its desired position. Always exercise unusual care in placing the foundation stones at each corner. So long as the corners continue unmoved, the foundation walls and the superstructure will remain firm and whole. Barns and other outbuildings, that do not stand over a cellar proper, should have a convenient basement beneath them. Even on level ground the earth may be excavated two or three feet, and the convenient room of one story more be secured beneath the same roof, by the expenditure of only a few dollars more than is required to place a building on half a foundation.

### SIZE OF BUILDING TIMBER.

It is not the largest and heaviest timber that makes the strongest and most permanent frame. Builders fall into an egregious mistake by employing building timber unnecessarily large for the purposes required. A plank two inches thick and eight wide, resting on a substantial wall of stone or brick, will subserve as satisfactory a purpose for a sill of a large house, as a stick of timber eight inches square. An injudicious custom has induced builders to employ, sometimes, three times more timber in making a frame than is really needful. A builder should study and endeavor to understand the strength of materials. He who can save a dollar's worth of timber, by providing the different parts of a frame of the most proper and desirable size, saves another dollar besides the first one, in the labor required to fit the timber for its appropriate place in the frame. There is a vast deal of philosophy and science in having every piece of timber in an edifice of such a form, as to render the frame more stiff and permanent. Sills, summers, beams and posts of both dwelling-houses and barns, are often made preposterously large. There is timber enough in many of the old houses and barns in the first settled localities of our country to make two buildings of the same size of the present one. In many country barns, the posts and beams are sufficiently large and strong for a bonded warehouse of some great seaport. Two small posts and a small beam, if properly put together, will sustain a superincumbent pressure of surprising weight.

The form of joists is a point that is not, to appearance, properly appreciated and understood. A stick of timber, for example, three inches by four, twelve feet long, would make a joist of a very unsatisfactory form. But, let the same quantity of timber be sawed into a joist eight inches wide, by one and a half inches thick, and it will sustain double the weight with less spring or deflection. In order to give desirable solidity to any floor, the joists must be wide, or deep up and down.

Inch boards, one foot wide and sixteen or eighteen feet long, would make joists that would spring but little; whereas, let joists of the same length and six inches wide be employed, each containing the same amount of timber as a board, and a floor laid on them would spring up and down to such an extent as to render the room exceedingly unpleasant to live in.

### ROOFS OF BUILDINGS.

If there is any one part of a building of any kind, that far transcends in value all other parts, it is the roof. Without a good roof it is utterly impracticable that other parts of a building should render satisfactory service. A poor roof is an intolerable nuisance even on a sheepfold or a dog's kennel. Whatever the building may be, a roof that will turn the rains of summer and the water from the melting snow that accumulates on the building in winter, is a consideration of primary importance to every person who owns a dwelling-house. Leaky roofs may be made of the very best of materials. A building covered with the choicest quality of pine shingles, if laid by a bungler, who is not careful to "break joint" properly, will leak badly. A few *poor* shingles in various parts of the roof, which is made mostly of the best shingles, will make a bad roof. Zinc cannot be relied on as a valuable roofing material, as it will crack. A tin roof will frequently corrode and crack, and become leaky, and it will often be impracticable to find the defective places which admit the rain. Slate is expensive and heavy. Over and above these considerations is the one all important one, that where dwelling houses are exposed to the heavy accumulation of snow in winter, water is liable to back up from the eaves and find its way beneath the shingles down to the inside walls. This is a common occurrence, and the walls of many fine houses have been nearly ruined by "back water" through the roof. The only reliable remedy is to form a roof of such material as the influences of the weather will affect but little, and which will endure for ages.

It is a subject of congratulation that science has recently enabled builders to avail themselves of a material for roofing that possesses the merit of cheapness and durability at the same time. We allude to the plastic slate roofing. We have no tin, plastic slate or shingles to sell; but we have seen, in the city of New York, enough of plastic state roofs to warrant us in stating, for the benefit of farmers, that this material is the cheapest, the most durable, and will render the best satisfaction of any material that can be employed for covering buildings. In company with J. R. Van

Orden, No. 41 Liberty street, we went to examine a number of large buildings in this city that are covered with plastic slate. And more beautiful roofs were never seen. Water may stand and back up for any length of time on them, and not a drop can get through to wet the walls. Those large buildings seemed to be covered by one broad and unbroken piece of slate, as durable as stone itself, and to all appearance they will remain perfectly water proof, and fire proof also, for hundreds of years after the men who made them have been forgotten.

The materials employed in making this kind of roofing are inhexaustible, and as cheap as the fragments of quarried slate and gas tar, both of which may be obtained at so cheap a rate that the expense of forming a durable roof will be less than it can be made of shingles of any kind, or of metal.

Some parties at first experienced serious difficulty in making a satisfactory roof of coal tar and the flour of slate. But, by repeated experiments, they learned that their failures were attributable to want of skill in mingling the two substances. Experiments showed that when the tar and the flour of slate were mingled in the proper proportions, the material would reconstruct readily, and form a most perfect roof, which will last as long as natural slate.

At the conclusion of this paper, the thanks of the Club were tendered to the author.

## DEPARTMENT OF AGRICULTURE.

The following letter from the Hon. Horace Capron was read before the Club, and a committee to respond to it was appointed, viz: Messrs. J. B. Lyman, J. E. Snodgrass and J. V. C. Smith:

"DEPARTMENT OF AGRICULTURE,
WASHINGTON, *Dec.* 31, 1867.

"JOHN W. CHAMBERS, Esq., *Secretary Farmers' Club, American Institute:*

"DEAR SIR—Believing that the usefulness of the Department of Agriculture, and its proficiency in the prosecution of its appropriate work must depend, in a great degree, upon its relations with agricultural organizations, I desire, in assuming the duties of my official position, to invite your coöperation, to claim your counsel, and to tender to you my hearty sympathy in your local enterprises, and any practical help toward their successful development. It is believed that such unity can be promoted by harmony of feeling and action between this Department and the State societies, as between those organizations and county societies and town clubs.

"The influence of State boards and societies upon the agriculture of their respective States, is already incalculably great; yet they are only in their infancy—with many difficulties to surmount and discouragements to face—which may be aided by judicious action of this Department, and may in turn be strengthened by association and labor with these local organizations. It is not my purpose to attempt to designate the modes in which this unity of action can be best attained; they will present themselves to your consideration in your daily experience; but I will venture to hint at a few obvious points in which you may always be able to advance the interests of this Department and of agriculture.

"You can render more successful the operations of the propagating garden, in testing the merits of new seedling fruits, by sending specimens of such as have attained local promise of value, for experiment in different latitudes under varying circumstances of treatment and culture. The receipt of seeds not tested will be properly acknowledged, and all plants or seeds, when desired, will be held subject to the control of the donor. Any new variety of fruit, not disseminated, may confidently be considered safe, not liable to premature distribution, to the injury of the originator.

"You can also render valuable aid in the study of diseases of fruit trees, by sending accurate accounts of their history, progress and effects. The result of local observations and experiment is desired, with a statement of influencing circumstances, including, especially, the hydrometric condition of the atmosphere, the dew point, elevation, shelter, &c. For the museum—or object library—of the Department, specimens of natural history, of seeds, fruits, fibers, minerals, and products of the economic arts, are solicited. It is intended, eventually, to furnish State organizations with model duplicates of type specimens of their most popular fruits.

"The building now in progress of erection for the Department will furnish ample accommodations, also, for a separate display and classification of the products of agriculture and the minerals of the several States, contributions for which object are now solicited. It is believed that this will prove an interesting and useful feature of the museum.

"In entomology, incalculable good may result from correspondence relative to insect depredations, with samples of the insects for identification, description and experiment.

"The coöperation of the State organizations in the collection of agricultural statistics, will contribute materially to the success of the Department operations, and to the general fund of agricultural knowledge. The results of the local associations and efforts, whether of county society exhibitions, of club meetings, implement trials, sheep shearings or other gatherings, might be presented in epitome, supplying facts that might not otherwise be so fully received; and reports, in detail, of special agricultural enterprises, of systematic experiments of individuals, and other occasional data, would serve to enrich the national repertory of industrial facts, and disseminate generally to other States a knowledge of the peculiar discoveries and improvements in each.

"This coöperation might perhaps be extended with advantage to the monthly crop returns, which form the basis of current approximate estimates of growing or harvested crops, by recommendation of the best men as reporters in those counties which cannot be represented by secretaries of the agricultural societies, and by concurrent data from other sources, and suggestions as to any peculiar or local subject of inquiry.

"The idea is also presented for the consideration of State societies and State boards of agriculture, of a still more intimate coöperation, involving the direction of returns to the officers of State secretaries in those States, their examination and consideration, and a report of results to this Department, for incorporation in the general statement for the entire country.

"Your views upon the above suggestions are respectfully solicited.

"In return, I shall always hold myself ready to answer any reasonable demands upon the resources or the courtesies of the Department.

"I am respectfully, your obedient servant,
"HORACE CAPRON, *Commissioner.*"

### SORGHUM SIRUP.

Mr. L. Pyle, Newcastle county, Delaware, sends the Club a small jar of sorghum sirup, which was handed to Mr. J. B. Lyman for his opinion of the same.

Mr. Lyman having tasted the sirup of Mr. P., and noted its color and consistency, pronounced it a superior article, of a clear straw color, thick and well boiled, so as to give no taste of iron.

### RESEEDING OLD GRASS FIELDS.

Mr. James Slocum, Brownsville, Penn., submits the following inquiries in relation to plowing up and reseeding grass lands:

"I desire to reseed my meadow with as little delay as possible. Would it do to turn over sod this month or next, subsoil the land and sow early with barley or spring wheat and seed with clover and timothy, and top dress with manure as soon as the grass is off? Would the sod or the grass roots be sufficiently killed that they would not take possession and run out the recently sown grass seeds? A part would be black soil on clay, but the larger portion red limestone or gravelly clay on limestone clay, subsoil plowed, and harrowed into the soil. By this preparation of the seed bed, an excellent catch of grass will be secured; and the burden of herbage will be heavy enough by September, or before, to yield a fair crop of grass. By raising a crop of grain, the growth of the grass will be retarded, almost one season.

"These suggestions are made with especial reference to renovating old meadows, or pasture fields, in the shortest possible time, without any reference to a rotation of crops, or the production of anything but grass. If a farmer has well rotted manure, or compost, it will produce a more satisfactory result to apply it to the soil, previous to seeding, than to withhold manure and top dress the young grass, after the barley or wheat has been removed.

"If the present grass consists chiefly of Kentucky blue grass (*Poa Pratense*), or Long Island blue grass (*Poa Compressa*), or red top (*Agrostis Vulgaris*), the roots will not all die, unless the land is plowed more than once. If the land be stocked down with red clover and timothy, where there are live grass roots of kinds just mentioned, the clover and timothy will be supplanted in two or three seasons."

Mr. S. Edwards Todd.—There are many things to be considered when an old meadow is to be reseeded. If there is a stiff soil it may not be the better way to plow the ground. But, if any considerable portion of the surface is bare, the land had better be plowed. When it is desirable to produce a firm sod as soon as practicable after the ground is plowed, the better way is not to raise a crop of grain. There is nothing gained, but a great loss sustained, by sowing grain with a view to raising a crop of grain and a burden of grass at the same time. It is an egregious mistake of multitudes of farmers to attempt to grow two crops on the same land at the same time. If the meadow has become what is termed "hide bound," it will be decidedly better to plow the ground, subsoil, if necessary, apply a bountiful dressing of manure, and stock down the land early in the spring, without sowing any grain. If the manure to be applied is coarse, let the ground be plowed shallow; and follow the common plow with the subsoil plow, for the purpose of keeping the best soil at the surface of the ground. If the fertilizing material is in such a condition that it can be harrowed in, the better way is to spread it on the surface after the ground is plowed. Adjourned.

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## January 14, 1868.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### USE OF GUANO IN VIRGINIA.

Mr. W. G. Pearse, Petersburg, Va.—As some of the members of the Club have expressed the opinion that the use of guano impoverishes the soil, and as the same opinion is very generally entertained by those acquainted only with the theory of its action, I wish to enter my protest against its entire or unqualified correctness. I do not assert that when applied for the purpose of obtaining a crop of grain only, the soil derives any permanent benefit from its application, but I am satisfied that, when properly used, it is the cheapest and most economical fertilizer for the worn-out soils of this latitude within our reach. My plan is as follows: After the crop of wheat—which is my leading crop—to which it has been applied, has been removed, I turn in the stubble—sow peas, buckwheat, or anything that will grow—fallow that in with another dressing of guano—sow to wheat again in October. Continue this process year after year, until the ground will bring a good crop of clover, then seed with clover in February or March—allowing it to grow until the next year—then cut the first crop or growth of clover for hay, and fallow in the second growth, which will be in the proper state in July, and sow again to wheat. After securing a clover fallow, I discontinue the use of guano, but apply lime, marl, ashes, or other alkaline substances instead. By this plan our worn-out lands can be surely and cheaply renovated, and brought to a high state of productiveness. Any man of ordinary intelligence and moderate means can practice it to any extent, as each crop will more than pay its cost. I will state one fact about clover that is peculiar to this section, or at least does not exist in the Northern States. We never have to sow clover seed but once on the same land. The seed that is fallowed in will remain in the ground many years without injury, and the plow will bring enough of it to the surface to vegetate and form a good stand every spring.

### MELLISH AND WHEELER'S YANKEE BERRY BOWL.

Messrs. Mellish & Wheeler, Bellows Falls, Vt., sent to the Club a crate of their Yankee berry bowls. They were much admired by the members of the Club, but it was thought that some of the baskets in use were preferable.

Dr. F. M. Hexamer said that these bowls were of a bad shape, being too broad for their depth, and required too much room.

Mr. S. B. Nichols, of Hammonton, N. J., preferred the Gothic basket, as it was very cheap, and might be given away with the fruit, thereby saving the expense of returning them-

Mr. Thomas Cavanach, Brooklyn, N. Y., had used some twenty different kinds of baskets and bowls, and liked the American and Beecher baskets best. These cost more than some others, but he had always found that a good substantial basket would be returned, while a cheap one was lost. Besides, fruit would command a better price in a handsome basket than in a homely one.

Mr. Wm. S. Carpenter preferred the Beecher basket to any other, as it was not only handsome, but very substantial.

### FOLDING PEACH BASKETS.

Mr. Olds, No. 24 Bible House, N. Y.—This is square, made of slats fastened at the covers with wires, and is flat when folded.

Dr. F. M. Hexamer and others thought it not so strong as the common peach basket, and Mr. Dodge said it could not stand much hard usage. Several spoke favorably of such a frame for a clothes basket, for this article should be light, have ventilation, and be large; hence, when not in use, it can be reduced to a small compass. For this purpose alone it is likely to be valuable.

### FEEDING SHEEP.

Mr. P. M. Rush, West Middletown, Washington county, Penn.—I have been feeding wethers for market since 1857, and I am learning yet. I select my sheep in the fall, being but three or four years old. I commence feeding lightly on corn in the ear, with some salt sprinkled over them, in good troughs, so as to enable them all to take hold and learn to shell for themselves. I scarcely ever shell it, but when I do, I mix one-fourth oats—that is, one peck to the bushel of corn, and give them all the hay they will eat. I always have clover and timothy mixed, with plenty of good water in the yard. I increase the feed to the first of February. I give a bushel of shelled corn to one hundred head. If I have not sold in February I shear early, but if the prices will justify, I let go before shearing. I never feed coarse sheep.

### HOW TO PRESERVE EGGS.

Mr. William Hosford, Cedarville, N. Y.—Dip the eggs in hot lard, and then pack them in jars or buckets, with the small end downward. They are to be kept in a cool, dry place. The secret is to close the pores and not injure the shell. Brine and other pickles destroy it.

### CHICKEN DISEASE.

Mr. Horace Wheeler, Providence, R. I.—I have about eighty nice fowls which I have taken great pains with, yet a short time ago some of them were troubled with swollen eyes. I have had twenty-five years' experience on the farm, but never saw a case like this before.

Mr. Wm. S. Carpenter.—Keep the poultry and hennery clean, and feed sulphur occasionally to the fowls with their food. Cleanliness is of great importance in poultry raising. The description is not sufficiently accurate to give a name to the disease.

### DIRECTIONS FOR POULTRY PACKING.

Mr. J. Beemer, Libertyville, N. J.—Fowls should never be fed within twenty-four hours of killing. Chickens will bleed much better with their heads off than with their throats cut. The neck-bone should be cut off about an inch, and the skin tied over the end of the neck. After the poultry is scalded and dressed, it is packed in barrels, with a layer of straw and a layer of poultry.

Mr. Wm. S. Carpenter.—The straw should be put in thickly.

Dr. J. M. Crowell.—The practice of plumping makes it look well for twelve hours, but after that it is in a bad condition.

### HOW TO PREPARE GLUE.

Mr. S. Edwards Todd.—Procure a small tin pail about four inches deep, with the top turned over like a flange, making a broad rim at the brim of the pail. This pail should be just large enough to enter a tea-kettle, when the lid is removed. A fruit can, with a flange soldered around the top, will make a satisfactory glue-pot. Have the tea-kettle almost full of boiling water, and set in the glue pail. Procure the best kind of glue, break it in small fragments, and fill the pail half full. Now cover the glue with water. Keep the water boiling until the glue is all dissolved, and is about the consistence of thick molasses. The tea-kettle may now be removed from the fire, but keep the glue-pail in the hot water in order to keep the glue warm.

When glue is prepared by placing the vessel which contains it on the stove, it is very liable to be burned, which will spoil it. But when it is heated in hot water, there is no danger of heating glue too hot while the glue-pot is in water. Procure a small paint-brush for handling the glue, and always keep the brush in the glue. When the glue appears too thick, pour in a little hot water, and stir it up thoroughly. When it is too thin, either boil it down or drop in a little more glue. Every surface to which glue is applied should be thoroughly warmed before the glue is laid on, and things that have been glued together should be kept in a warm place until the glue has become hard. With a few cents worth of glue, and a cheap glue-pail, prepared in the foregoing manner, almost any person can unite broken articles in a neat and satisfactory manner at a trifling expense.

### HOW TO MAKE CONE FRAMES.

Mr. S. Edwards Todd.—There is a great deal of real beauty in cone frames; and more than this, they tell of artistic skill and good taste and practical utility, which is never thought of when we are looking at a rich and costly gilt frame. Pictures of every description and character are inclosed in cone frames, and the most fastidious in such matters exclaim, before they are aware of it, "How beautiful that is." The most costly kinds of photographs, of large size, are put in cone frames of an elliptical form; and pictures that you have had for a long time, hoping to have them framed, would look well in square cone frames, which you can make with your own fingers just as well as a robin can build her nest. The expense will be but a few cents each, besides the glass. Preparing the materials to operate with is the main part of the business.

There are many ways of preparing the bodies of cone frames. The body of a small elliptical frame, for a photographic likeness, may be made of a few thicknesses of pasteboard, glued or pasted together; or it may be sawed out of a seasoned piece of thin or thick board, according to the size desired, and the surface dressed off smoothly. Or the form may be circular or square, or octagonal, to suit the fancy. A very common way of making them is to use thin strips of wood, from two to three inches wide and about half an inch thick; halve the corners together, glue them, and secure the corners with small brads.

It will be understood that the inside corners of frames must be rabbeted out for receiving glass of a given size; and when they are made of pasteboard, two thicknesses, narrower than the rest, must be glued to the back side.

When it is not desirable to have such frames of the color of the wood, black cambric is pasted over the wood, and when it is dry the cones are glued on it. Such frames may also be covered with any other material similar to cambric. Many kinds of wall paper can be used for such purpose, or the material used for border could be used if desirable. For covering frames with such materials, paste is better than glue, as it will dry sooner. But when frames are to be left of the color of the wood, such portions of the frame as are not covered with cones may be varnished the last thing. If a frame is made of pine, for example, after the cones have all been put on, let the parts which are not covered with cones be oiled with boiled linseed oil, and afterwards varnished, and the color will be a bright straw color. Frames should not be painted nor varnished until the cones are glued on them, as glue will not adhere well to paint nor to varnish. If the moisture is not all dried out of the cones before they are used, they will shrink and make the work look badly. When putting the cones on, place the frame on the table in a warm room—as glue will not dry well in a cold room—and, with a sharp pocket-knife, cut off the large end of the cones, so that they will stand erect. Dip the ends in glue, and place them around on the frame to suit the fancy. A large one may be placed at each corner, and smaller ones in rows or in clusters, or in any desired manner. Acorns, chestnuts, buckeyes, horse-chestnuts, and even beechnuts and apple seeds, may be worked in with good taste. When the face of the frame is finished and the glue has become dry, turn it on one edge and place a row of acorns, or any other kind of nuts, on the edge of the frame, and the next day glue another row on the other side, and so on till the frame is finished. Always use plenty of glue, and if the glue should settle down around the base of a nut, or cone, it will be all the stronger for it. After the glue is hard, spread two coats of varnish over cones and nuts, and the frame will be ready to receive the picture.

Almost any kind of varnish will subserve a good purpose, providing it is good. Demar, or white varnish, is as cheap as any furniture varnish, and will dry quick and look well; but shellac varnish is much cheaper than any other kind of varnish, and will dry in half an hour, and will make cone frames look beautiful. To make it, procure the shellac—a kind of gum—at the druggist's, and put it in a bottle or jug, and apply enough good alcohol to cover it; cork it tight and keep it in a warm place, and in a few days the gum will all be dissolved. If the varnish is too thick, apply a little more alcohol. Adjourned.

## January 21, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### THE BEST TIME TO CUT HAY.

Mr. H. A. Wilcox, Mendon, Adams county, Ill.—Believing that in all temperate climates grass is king, and that the nutritive qualities of hay depend much upon the time that grass is cut, any light that can be thrown on this subject is of importance, as all will acknowledge, who think of the many millions of wealth involved, and the great results depending thereon.

I think we can safely make this assertion, that all annual plants, and all plants that are cut to the ground every winter, reach their full growth when in bloom. The blossom is the last stage of growth. Every blossoming plant has then reached its utmost growth and strength. The strength of a plant at this time is equally diffused through all its members. Blossoms, leaves and stalks are all full of vitality. The next stage of existence is the formation of its seeds. As the seeds grow larger, the leaves and stalks grow smaller; then the strength and vitality leave them, and, when the seeds are fully ripe, the leaves fall from the stalk, and the stalk becomes dry and worthless. Look at a stalk of corn when in full bloom. How full of strength and vitality it is. It has reached its utmost growth. As soon as the ear is formed, then the strength begins to leave the stalk and leaves. As the ear grows larger, they grow smaller, and when the ear is fully ripe the leaves dry and blow away. All, or nearly all, the strength of the plant is concentrated in the ear. Hence, the best time to cut hay is when the grass is in blossom. I know there is an objection with regard to timothy, as the pollen from the blossom makes it disagreeable to work among; but it should be cut as soon as the blossom falls. All other kinds of grass can be cut in bloom as well as any other time. True, it takes a little more labor and time to cure it properly, but when it is cured the whole strength of the grass is retained, and it will keep stock in as good condition in winter, as when eating grass in summer, providing they are properly sheltered.

### HOW TO FEED AND FATTEN SHEEP FOR MARKET.

Mr. A. G. Meiklejohn, of Putnam, Washington county, N. Y.—Have your sheep as fat as possible—the fatter the better—by running in good feed in the fall; then put them up for winter in sheds well ventilated, and not too warm, with suitable yards adjoining; feed all the good hay they will eat, and they will improve in flesh; and when within eight weeks of the time you wish to market them, begin *moderately*, and feed corn, that they may not become cloved, and in the course of eight weeks feed to each sheep about one bushel of corn, or its equivalent, and your sheep, if properly fed and managed, will be fat and full, ready for the shambles. Sheep are fond of peas, which have the fattening quality, and give more weight to the wool than corn; but if continually fed on them, may make their gums sore. Oats may be used for a change. A little salt, occasionally, will assist the appetite and prevent "stretches."

### GRAFTING WILD GRAPE-VINES.

Mr. N. B. Colton, New Liberty, Scott county, Iowa.—I have a great many wild grape-vines on my farm, numbers of which were well loaded with fruit last season. Would it not be a much cheaper and quicker way to graft in some variety of tame ones? Would you graft in the vine or root? Are there any varieties of tame grapes that will survive the winter of Central Iowa, unprotected? Will it do to cut grafts from vines that were laid down last fall, as soon as they are taken up next spring?

Mr. N. C. Meeker.—Such roots can be grafted by digging down from four to six inches, as soon as the frost is well out of the ground; make a cleft and insert two grafts, one on each side, so as to be certain that one will grow. Cover up nicely, so as to leave the grafts just above ground, and put stakes to prevent injury. Any thrifty vine, and of last year's growth, will answer for grafts. The Concord should do well. Mr. Smith, of Des Moines, has succeeded remarkably well with grapes, and that should settle the question for Central Iowa.

### RESPONSE TO THE COMMISSIONER OF AGRICULTURE.

Mr. J. B. Lyman then read the following communication to the Commissioner of Agriculture, which was ordered to be printed, and a copy forwarded to the Commissioner:

"Rooms of the American Institute Farmers' Club,
New York City, *Jan.* 21, 1868.

"To Hon. Horace Capron, *Commissioner of Agriculture, Washington, D.C.:*

"Dear Sir—The undersigned committee, appointed by the Chairman of the Club to prepare a reply to the recent communication received by the Society from the Commissioner of Agriculture, in answer to his very full and suggestive letter, and on behalf of the Farmers' Club, take this occasion to say:

"That we congratulate the Commissioner on his accession to the control of a very important department, affording him such rare opportunity to promote interests so fundamental, so wide and so perpetual as those of agriculture. We reciprocate the sentiment expressed by the Commissioner, and indorse especially that part of his letter which refers to the importance of hearty coöperation between the Department at Washington and all State and local societies throughout the country. We think good husbandry can be much promoted by cordial reciprocity between our Club and the Department; and we will endeavor at all times to carry out any suggestions that we may receive from the Commissioner, and do all in our power to disseminate any information or valuable matter of any description with which we may be favored.

"We think the Department has hitherto been shorn of much of its possible power for good by want of free, natural and open communication with the masses of the agricultural population. Great numbers of the reports, crowded with valuable matter and replete with instruction which the farmer can find nowhere else, have been tossed in piles in the corners of postoffices, have gathered dust in the offices of lawyers and local politicians, or been sold by Congressmen for waste paper.

"We suggest that the leading metropolitan journals of the country, reporting the action of agricultural societies, offer to the Department a more certain and trustworthy avenue for reaching the people of this nation with the facts, statistics and records of experience which it is the office of the Department of Agriculture to collect.

"Speaking for this part of the country, and from the information which comes before us in our weekly sessions, we take this opportunity to suggest to the Department the difficulties and defects in farm practices, in order that the essays published annually or the monthly reports and farm knowledge that come within our knowledge, may to some extent reach and remove these evils.

"1. Farmers east of the Alleghany range, in Eastern New York, New Jersey and the New England States, have been for many years less successful in growing fruit, and especially apples, than formerly. Whether this is owing to changes in climate, to exhaustion of soil, or bad culture, or to all these causes combined, we are unable to say. So general has been this failure, that the seaboard cities of the North now depend for their apples almost entirely upon Western New York and the States bordering on the great lakes.

"2. The farmers of this region are by no means properly impressed with the importance of saving all substances that have value as manure. A great improvement has taken place in this respect, but liquid excrements are not absorbed and returned to the soil as they should be; bones are thrown away like brickbats, while at the same time high prices are paid for commercial fertilizers, often deceptive in their composition and unprofitably applied. The Club does not know of any one subject upon which it is so important to arouse the minds of the rural population as upon the value of different fertilizers, and the supreme necessity for restoring in some manurial substance as much potash, lime and phosphorus as the crops remove. We regard this branch of economy as fundamental to all sound husbandry, and cannot but hope that the Commissioner, in his wisdom, may devise some way of illuminating the ignorance and removing the indifference of our farmers on this vital point of agriculture.

"3. We observe with some alarm the decrease in the productiveness of our wheat fields; especially those of the Northwestern States. While such large exportations of the cereals are annually made, and the surfaces from which the crops are taken are scantily manured, the result must be an exhaustion of the more rare and valuable constituents of a fertile soil, and the removal of those substances to the great centers of European life and industry.

"We therefore trust the Department will earnestly recommend to our agricultural communities to export butter, cheese, wool and products which remove but moderate portions of phosphorus and ammonia from the soil, and not take away the fatness of our lands by such enormous exportations of grain.

"We have no doubt that these rules have been observed by the

Commissioner, and we mention them—not so much as original suggestions, as by way of expressing our willingness to cooperate with the Department in any plans that may be thought effective toward their removal. We notice that the Royal Agricultural Society of England has of late offered eleven prizes for essays and reports on subjects of greatest importance to the English farmer, and we cannot but think the example a proper one for the Department of Agriculture in this country to follow.

"With regard to the manner in which the annual reports are compiled, we take the liberty of referring your Honor to the system adopted by the State Board of Connecticut. Each year all the papers, lectures, reports and discussions are restricted to a prescribed general topic. Last year, for instance, the subject was fruit culture. This year, it is neat stock. In this way a series of volumes is at length produced, each one of which is quite exhaustive on one important branch of husbandry, and the whole taken together forms an orderly and well-digested agricultural library.

"JOSEPH B. LYMAN,
"J. E. SNODGRASS, } *Committee.*"
"J. V. C. SMITH,

Dr. F. M. Hexamer, Newcastle, Westchester county, N. Y., read the following paper on

### THE GERMINATION OF THE POTATO.

The eatable portion of the potato plant, the potato proper, is generally classed among the roots; yet, on examination, we find that it has nothing in common with roots, except that it grows under the soil, as most, though not all, roots do. The potato tuber is simply an enlarged subterranean branch, and a careful examination shows a complete analogy with common branches. The starting point of the underground potato branch has no direct connection with the roots of the plant; and sometimes even, tubers will start from branches above the ground. When we dig up a potato plant, at the time the tubers begin to form, the subterranean branches, which afterward become the connecting parts between the main stem and the potato, appear exactly like overground branches grown in a dark place, or like sprouts grown in a cellar. The branch enlarges abruptly, the sugar contained in its lower part is transformed into starch, and we see the potato tuber forming. If left in the ground where it cannot be destroyed by frost, this enlarged branch will stand again in the following spring, and form an independent plant which, in its turn, repeats the same process.

The eyes of the potato are exactly what the buds are in other branches, formed for the same object and subject to the same laws. Beginning at the stem, or lower end, and following the arrangement of the eyes, we trace spiral lines, in the same manner as with buds on the branches of a tree, and find that the eyes and buds increase in numbers towards the end. We observe, therefore, that the potato is not only a branch in theory, but in its practical bearings also, it is governed by like laws.

The planting of a whole potato is simply a propagation by layering. It is nature's mode of multiplying the individual plant, just as she multiplies an individual grape vine, by bending its branches to the ground to take root at the joints. The planting of a half or a larger part of a potato, corresponds with the propagation by long cuttings, as is the case with currants, quinces, &c. Separating the stem end of a potato from the bud end, is similar to dividing a long cutting in two; you may plant either end and it will grow. The planting of pieces with one or two eyes is analogous to the same process with other branches.

We can make a grapevine grow from pieces with single eyes, or more, without being able to foretell which will make the best plant. Nature has so well cared for the propagation of this useful plant, that even pieces without eyes will sometimes grow, just as a grape cutting without eyes will frequently take root. In my experiments, out of seventy pieces planted without eyes, thirteen grew and produced potatoes—about one out of every five. This fact proves that the starting point of germination is not necessarily confined to the existing eyes; adventitious buds may, under favorable circumstances, form in any part of the surface of the potato. Sometimes even all the germinative power will become concentrated in an adventitious bud, while every visible eye remains dormant. To prove still more this fact, I planted seventy potatoes peeled so thickly that no eyes were visible; thirty-five, exactly one-half, grew, and some of them produced very large potatoes.

The practical value of these results is of more importance than may appear to the superficial observer. My object in making these experiments was to prove just the opposite of what I found to be the facts, and facts admit of no controversy. We have so long been taught to take all possible care not to mutilate any eye of the potato, when preparing them for planting, and have spent so much time in surveying our field before deciding where to inflict the bold stroke, that I was slow to convince myself of the fact that potatoes can be cut for planting without intelligent judgment. It is now beyond doubt that potato planting machines can be constructed to cut the tubers into pieces suitable for planting, without diminishing their germinative power more than when done so by human hands. This leads us to the question, which is the *best mode of planting potatoes?* For several years I have tried, by experiments, to solve this question, and I will give you the result of my last year's experience, which very nearly corresponds with my former observations. When the potato is planted whole, all the germinative power will concentrate in the terminal eye—out of one hundred hills only two will develop side shoots. Do we cut the seed end off, however, two, three or four eyes nearest the cut surface will start and divide the nutriment in the potato between them. The same is the case in a young branch. If we leave a last year's shoot of a tree unpruned, the sap will concentrate in the terminal bud, and a few or no branches will grow. In pruning, we cut off this bud, and two, three or four side shoots will be the result. The only difference between the branch and the potato being that the first receives its nourishment or sap from the tree it is connected with, while in the latter there is enough food deposited to support the germinating process.

| MODE OF PREPARING SEED FOR EXPERIMENTS—1867. | Total per acre, bushels. | Bushels large potatoes, per acre. | Bushels small potatoes, per acre. | Per cent of large potatoes. | Per cent of small potatoes. |
|---|---|---|---|---|---|
| One large, whole potato | 114 | 87 | 27 | 76½ | 23½ |
| Two large half potatoes, cut lengthwise | 106 | 79 | 27 | 74½ | 25½ |
| One seed-end of large potato | 106 | 73 | 33 | 69 | 31 |
| One large half potato, cut lengthwise | 101 | 75 | 26 | 74 | 26 |
| One large potato, seed-end cut off. | 100 | 67 | 33 | 67 | 33 |
| One stem-end of large potato | 99 | 67 | 32 | 67⅔ | 32⅓ |
| Two small whole potatoes | 87 | 60 | 27 | 69 | 31 |
| Two pieces, with one eye each | 71 | 47 | 24 | 66 | 34 |
| One piece, with four eyes | 70 | 50 | 20 | 71½ | 28½ |
| One piece, with three eyes | 70 | 50 | 20 | 71½ | 28½ |
| One whole, medium-sized potato | 67 | 47 | 20 | 70 | 30 |
| One piece, with two eyes | 64 | 47 | 17 | 73 | 27 |
| One-half, medium-sized potato | 60 | 43 | 17 | 71⅔ | 28⅓ |
| One whole, small potato | 53 | 33 | 20 | 62 | 38 |
| One piece, with one eye | 45 | 33 | 12 | 73 | 27 |
| One-half, small potato | 33 | 19 | 14 | 58 | 42 |
| Field crop | 95 | 64 | 31 | 67⅓ | 32⅓ |

The experiments, of which I give you the results in the foregoing list, were made with the white peach-blow, but owing to the wet season, the yield of this variety has been much smaller than in former years, so that the number of bushels per acre should be taken as the comparative quantities only. The figures given are derived from seventy hills of each manner of planting, and equalized to the rate per acre.

The greatest yield was obtained from the largest potatoes, planted whole, as was the case in all my former experiments. The smallest yield from the smallest potatoes, cut in two. The large and small potatoes of each row were carefully assorted and measured, which resulted in the remarkable fact, that the larger the yield the greater has been the proportion of large potatoes. Comparing the figures in the above list, we must come to the conclusion, that the size of the piece is not the most important part in planting potatoes. If one healthy, matured eye of a grapevine makes a better plant than a long cutting of immature wood, so will a piece of solid and ripe potato produce more and better ones than a whole potato which is diseased or unripe. My practice in planting the field crop has been, to take more of smaller than medium-sized potatoes; these were planted whole, larger ones were cut in two, and the largest ones in four pieces, always taking care to select only sound and well-matured tubers. The above yield, at the rate of ninety-five bushels per acre, was the return of two acres, planted in this manner, and is only nineteen bushels per acre less than the highest yield on the list. To one acre planted in this way, it requires about five barrels of seed. The planting of one acre with whole potatoes of the largest size would require four times that quantity. To obtain a barrel of seed potatoes of the largest size, like those which gave the best yield, would take the largest of about five barrels of marketable potatoes, and reduce the value of the balance considerably. If we deduct in both cases the value of the seed from the product per acre, the result of the field crop will net the most profit. We have, therefore, no evidence yet that there is a more profitable mode of planting than the one just spoken of as practiced by us.

Although the above experiments were made with the utmost exactness, we should not place implicit reliance in one single experment. Different seasons and different soils may give other results; but every experiment helps to solve the great questions which concern the agricultural interests in common. In my experiments of last season, for instance, the medium-sized whole potatoes have given a smaller yield than I have formerly received, and the two small potatoes, planted in one hill, produced far more than in former years. In order to give the most valuable results, such experiments should be repeated by different persons, for a number of years.

*Difficulties of making Experiment.*—The difficulty to get the correct results of experiments is much greater than is generally supposed. If, in a row of seventy hills, two of them should fail, it would make a deficiency of three barrels on the acre. Therefore, experiments are the more valuable, as the scale on which they are made is larger. Then, again, there is often a difference in the soil in one and the same field, influencing considerably the uniformity of the production. To make experiments requires a great deal of careful reflection and action, and no one can make them serviceable without a knowledge of a natural history of the things with which he is experimenting. To judge always correctly between the cause and effect, we must have a knowledge of the positive sciences, and, by the study of them, the mind must be trained to observe and judge correctly. The habit of expressing and describing facts superficially, is so common, that, in the majority of reports, we find the words "many," "few," a "good number," "fair yield," and the like, where figures, measures and weights ought to express the quantity. For this reason, hardly one out of ten experiments reported to this Club is of any value.

While making experiments in the field we encounter, also, difficulties of another character. The farmer, in general, is, at the season of the year when they should be made, so occupied that the experiments planned during winter, to be made next spring, are mostly postponed to another year. It requires a great deal of patient perseverance to take your memorandum-book during the hurry of spring work, and note down the number of hills of each variety, to prepare and cut the pieces carefully for a few rows, when everything is behindhand, a storm is threatening, and you know that you might have planted half an acre while you were making experiments. Or, may be, a neighbor happens to drop in and kindly reminds you with: "What's the use of fooling away your time; if I wanted to raise potatoes, I'd go in the lot and plant them as my father did, and he was considered the best farmer in the town; and when digging time comes around, I'd find how many I'd got." It requires a great deal of faith in progress and science, not to be discouraged by like circumstances. It once happened to me, that, after carefully cutting a hundred pieces of potatoes without eyes, and having each piece examined by three different persons, so as to be certain that no eye was visible, I was called away from the field. On returning, I found that one of my men had thrown them in the pig-pen, as, according to his explanation, "they were not good for anything; they had no eyes on them." It required more than ordinary strength of mind to repeat the same tedious experiment.

If I have occupied the valuable time of those present longer than anticipated, allow me to remind you that the value of the potato crop to this country is so great, and the loss during the past season has been so severe, that we cannot give too much attention to so important a subject. The average potato crop in the United States, during a favorable season, amounts to 150,000,000 bushels, which, at one dollar a bushel, are worth $150,000,000; equaling the interest on our whole national debt. The yield of the past season, throughout the whole extent of our country, has hardly been half a crop, making a loss of 75,000,000 bushels, equal to $75,000,000. Such an enormous loss on one crop, in a single season, is well worth the consideration of every intelligent agriculturist; the more so, as this loss has to be suffered by those who are the least able to bear it. The potato is the poor man's food. He looks for it when he is thrown out of employment, and has to live on the cheapest he can procure.

Are there no means to prevent the disasters of such a season, as the season of 1867 has been? Do we not have intelligence enough in our country to investigate the causes of failure, and find means for its prevention? There can be more honor achieved in agriculture than in any other department of science. The man who shows us how to restore the potato to its original vigor and productiveness, will be as honored a benefactor of the human race as has ever lived; and he will be a great as hero as the general who wins a hundred battles.

In Europe, where everything is regulated by the governments, there are experimental farms to investigate agricultural matters. Here we have no such institution, and it is doubtful whether much good would result from it if we had one. The climate and soils are so varying in the different sections of our continent, that the results attained in one part would not apply to the others. Our experimental farm extends from the North Pole to the Mexican

Gulf, from the Atlantic shore to the Pacific Ocean. The experimenters of it are the North American farmers—a more intelligent corps of observers than any monarch could ever employ. All we need is to collect the results of their experience, to derive from them the facts which show us the unerring truth.

Let us step forward, then, and tell our farmers that we are ready to coöperate with them, that the results of their experiments shall no more be lost. Let us lend them a helping hand, and thus make the American Institute in reality the National Institute of America.

At the conclusion of this paper, the thanks of the Club were tendered to the author.

### HOW TO GROW EARLY POTATOES.

Mr. J. C. Thompson, Tompkinsville, Staten Island, then read the following article, which will be found an excellent appendix to Dr. Hexamer's paper about potatoes; he said:

*Gentlemen of the Farmers' Club:* At our last meeting I exhibited a small box containing sixty sets or eyes, cut from one pound of early Goodrich potatoes, sprouted in fine sand, kept moist by occasionally watering with tepid water. Those who saw them will recollect the sprouts were from one two inches long, and the fine rootlets pushing out from the sprouts were about six inches in length, and all in fine condition for planting. The sets exhibited had been in the box about two weeks, and kept in a warm place. Perhaps there is no subject that more deeply interests alike the poor and the rich than the successful cultivation of potatoes of fine quality, that produce well and keep well. Many of you will recollect that Mr. D. S. Heffron, of Utica, New York, (the worthy successor of Mr. Goodrich), addressed the Club a few weeks since on the habits of the potato, and its great value as food for the human family. Mr. Heffron then said, "The potato is the poor man's bread;" allow me to add, that I regard it as not only the poor man's bread, but the rich man's luxury—for there are few of either class who regard their dinners complete without that invaluable vegetable, the potato. With this brief prelude, I will proceed to describe my mode of producing fine, early potatoes about two weeks sooner than when planted in the ordinary way.

*How to prepare sprouting boxes.*—Prepare a set of shallow boxes from two and a half to three inches deep—soap or candle boxes slit twice length or flatwise will make three boxes of the required depth, the top and bottom make two, leaving the middle piece to be furnished with a bottom. The third of a soap box will hold from one hundred and twenty to one hundred and thirty sets or eyes; the third of a candle box about sixty sets. If the sets are planted out in rows, a foot apart in the row, every thirty-three sets will produce one bushel, or three bushels to every hundred feet of rows, if planted in rows three feet apart. Or eleven hills, three feet apart, three plants in a hill, set about a foot from plant to plant in the hill, should produce a bushel of potatoes when ripe—equal to four hundred and forty-four bushels per acre. With this information, all can tell the number of boxes required to furnish sets sufficient to plant any desired space.

*Compost for the sets.*—Mix up a lot of sand and good soil, or sand and fine manure, or finely sifted coal ashes sand and, or fine sand alone—boxes and compost ready.

*Cutting the sets.*—Select from your stock of potatoes all those that have good strong sprouts at the point or nose end; cut off each sprout with a bit of the potato attached to it. The end sprouts to be kept separate and marked No. 1; the next or middle sprouts or eyes, No. 2. The eyes at the stem or butt end, No. 3. Number the boxes accordingly, and when ready to set in the open ground, plant out in the same order. No. 1, will ripen first, No. 2 next, and No. 3 follow. The eyes being ready, cover the bottom of the boxes with the compost; then set the eyes on it so they touch each other; fill up the boxes with the compost; wet with warm water occasionally; keep in a warm place. If desired to push them foward, keep quite warm and moist; if necessary to retard them, remove to a cool place. From two to three weeks brings them into fine condition for setting in the open ground, which is generally the first week in April, in the vicinity of New York city. A few days prior to planting out the sets, water should not be applied—letting the sets dry off greatly facilitates the separating of the rootlets—for overturning them out of the boxes. They will be found in a compact mass, like a sod of grass. Careful and repeated shaking will separate them nicely, preserving the rootlets of each set entire. If any of the sprouts have grown too long, so they would appear above ground when planted, such should be laid down and covered with earth if danger of frost.

*Setting out the sprouts.*—The ground being prepared, rows or hills opened, the sprouts are set in a foot apart, and covered first with fine horse manure and then with earth; if ashes or ashes and plaster is used, then a slight sprinkling of either before covering, to be repeated as a top dressing when the sprouts appear above ground. The ground must be kept in a fine mellow condition at the sides of the rows and well drawn up to the vines as they advance in growth.

*Kinds to plant.*—For early planting I recommend the Early Goodrich; it is very early and productive, quality fine, cooks dry and mealy, even before ripe; has improved in quality, with me, the past two seasons; product, with ordinary care, 300 to 400 bushels per acre—extra care, 450 to 500 bushels. For late planting, the Harison. This is a fine variety, keeps well, and is still more productive than the Early Goodrich. I have raised three pecks from less than a pound of seed, and have reliable information that five bushels were raised from five ordinary sized potatoes, during the past season; product from 400 to 500 bushels per acre—with care they should produce 600 bushels. I said the sets should not be placed less than one foot apart in the rows, and I am not sure but it would be better to set them fifteen or sixteen inches apart, especially for Early Goodrich and Harison. To plant an acre in rows three feet apart, and sets one foot apart in the rows, it takes 14,520 sets, and the same number of sets to plant an acre in hills three feet apart each way, three sets in a hill. If we allow a pound of potatoes to give sixty eyes, we get about 3,300 sets from a bushel, or at the rate of four and a half bushels of seed to plant an acre. As it takes 14,520 sets to plant an acre, if we get only one pound from each set, the yield will be 250 bushels per acre; if two pounds 500; if three pounds 750, if four pounds 1,000 bushels per acre. As I have repeatedly dug four pounds from a single set—being at the rate of 1,000 bushels per acre—the question arises here, can we plant and cultivate 14,520 sets so as to make each set produce four pounds, or as near to it as possible? Thomas Bridgeman, the author of the "Young Gardener's Assistant," says, under the head of potatoes: "Potatoes being of such extensive utility, various expedients have been contrived with a view to find out the best method of preparing the seed. In many parts of England the farmers never plant them whole. They take the potatoes as they come to hand, and in cutting them take care to have two good eyes to each set. The small potatoes are deprived of the sprout or nose end, as it is generally considered that a redundancy of eyes exhausts the sets and produces weak plants, which are not calculated to yield a full crop. I have frequently known from five to six hundred bushels raised from an acre, with small potatoes alone, cut in this way. Some prefer planting the sets immediately after they are cut. The better way is to get them cut a week before the time of planting and to lay them out on a barn or garret floor to dry." He furthermore adds: "The mode of planting is in drills thirty inches asunder—sets dropped three inches to eight apart." Now, in my opinion, here is where the mistake lies—for I find that my crops have increased since I reduced the eyes one to a set, and increased the distance between the rows as well as the distance between the sets. And I therefore lay it down as a rule: First, no more than one good eye to a set; second, drills at least three feet apart; third, sets at least a foot apart (perhaps better at fifteen or sixteen inches); fourth, ground cultivated deep, kept fine and clean, and well worked up to the plants as they grow. If 600 bushels of potatoes can be raised on an acre in England, some progressive Yankee will yet find out a plan to grow 1,000 bushels in America, and he who does, deserves a patent, besides the thanks of every man and woman, and will prove himself a benefactor to the world.

At the conclusion of this paper, the thanks of the Club were tendered to the author.

### REMARKABLE POTATOES.

Three potatoes of great size and fine appearance were sent by Isaac W. Vere, of Camden, Seward county, Nebraska; two called the Shaker Russett, and one the Prairie Flower. He says he raised 242 bushels from one potato, and one of his neighbors produced 312 bushels to the acre. The specimens were given to Dr. Hexamer, with the request that he raise as many as he can from the eyes, and give the Club the product for seed.

### LIMA BEANS.

Mr. O. F. Lyon, Pleasant Valley, Washington county, Pa.—What amount of Lima beans can be raised from an acre, and how far apart should the rows be planted? Also, do they require rich ground?

Mr. Wm. S. Carpenter.—I plant mine in good rich soil, about three or four feet apart, and to insure success they should be put in about the 1st of May.

Dr. Wm. B. Peck.—They are planted from two and a half to five feet apart each way. A good crop is from twenty to fifty bushels shelled, and they sell from two to ten dollars per bushel.

Mr. Thomas Cavanach.—We plant three by four feet—about tho 15th of May.

### LONG ISLAND LANDS.

Mr. Aaron Stone, Brooklyn, L. I.—We, as farmers, have felt aggrieved at the statements in relation to Long Island and the Long Island Railroad Company. If editors and reporters will tell the truth about our lands we will not utter a word against the reports. I know the agricultural advantages have been grossly misrepresented by men who do not know good land from poor. I have had some considerable experience in the cultivation of Long Island land. I have no land there now, but I mean to have a farm there before long. Notwithstanding all that has been said against the land there, I am confident that I can make farming pay there. Only a few years ago I went to Jamaica to see the land there. I traveled over a large tract, and dug holes in the soil in a great many places to ascertain what the quality of the soil really is; and I found a beautiful yellow loam—not worthless barren sand—from two to four feet deep, all over the tract. It is true the land there is not as rich as the soil is on our Western prairies. But it is a good soil, capable of being cultivated with satisfactory profit, and with no more manure than farmers are accustomed to use on their good land in other sections of the country. The Long Island land may be made exceedingly productive. Milk dairying can be made to pay well. Mr. Stone made further timely remarks touching the system of farm management on the Island, which were favorably received.

The Chairman.—The time has come when people must cease to speak reproachfully of Long Island lands. There are to-day 300,000 people in the city of Brooklyn who are looking for support and homes on Long Island and other places. People are wiser than they used to be. Experience demonstrates that the soil is all right. And if it is managed properly it will yield crops in abundance.

Mr. Wm. S. Carpenter.—Long Island lands cannot be called barren by any means. There are an immense number of successful farmers on the Island. They make farming pay well there. They have good farms. They raise bountiful crops. And if the land were barren sand they couldn't do it.

Mr. Aaron Stone.—The soil there needs feeding as much as a horse needs feeding. There is no difficulty in making farming pay well there, if they will only apply the fertilizing material that all farmers have access to. The fault is in the managers and not in the soil.

### MEAD'S CONICAL PLOW.

Mr. Solomon Mead, New Haven, Conn., brought before the Club a full-sized specimen of his patent conical plow. He claims that a curve of the mould board that will fit the outside of the frustrum of a cone is the best shape for a plow. This form he insists is superior to all others in four respects: 1. It gives a thin entering wedge at the toe, and thus separates with greater ease the earth in the furrow from that below. 2. The changes in the curve of the mould board are such that the earth, when not green sward, crumbles and falls light, not being turned over without loosening, as by the action of some plows. 3. In plowing green sward this form turns the sod entirely over, not requiring the tread of the plowman to make the turf lie down. 4. All parts of the plow are constantly scoured, and thus kept bright and smooth.

Mr. E. Williams.—There is no way to judge of this plow but to try it in the field.

### MABBETT'S FRUIT BASKET.

Mr. Truman Mabbet, Vineland, N. J., brought in a new style of fruit basket, which was received with satisfaction, as possessing points of superiority not common to baskets now in use. The baskets are made without nails or pins. They cannot be taken apart without some of the pieces are broken. The basket is in the form of a half cylinder or bread tray, made of a very thin piece of wood, with the ends secured in a circular dove-tailed groove. The ends are square, and both ends and sides are perforated with numerous holes, for the purpose of more perfect ventilation. The boxes or baskets are so arranged in crates that the berries cannot fall out if the crates are turned over and over.

### LIGHTNING MEAT CUTTER.

Mr. R. C. Browning, No. 32 Cortlandt street, was introduced to show his "Lightning Meat Chopper," consisting of a revolving tub, which holds the sausage meat or mince meat to be chopped—one knife wheels on a crank. The knife is secured to the end of a small pitman, which is made to move up and down, and in a horizontal direction at the same time, by means of a set of gear wheels. At every stroke of the knife the tub is made to rotate or move around a short distance. By this means the knife cuts down through the mince meat in a new place at every stroke, thus reducing coarse pieces to fine "mince meat," with astonishing rapidity.

Mr. Marsh, No. 33 Maiden lane, showed a dipper, with a graduated scales on one side for weighing any kind of materials, by placing the substance in the dipper, and setting it in water. A pound will press the dipper down to the one pound mark. Two pounds will force the dipper in the water to the two pound mark.

Mr. L. S. Ball, Quakertown, Penn., wrote to the Club that he has several choice young apple trees that have been girdled by swine as high as the swine could reach. He boxed the trunks and filled in with earth to save the trees. He asked if there is any hope that they will live. The answer was quite doubtful.

Mr. A. S. Fuller said if the trees are still alive, let the girdled space be "bridged" as soon as possible. That process *may* save the trees. Bridging the girdle with pieces of limbs can do no harm. Adjourned.

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## January 28, 1868.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### HONEY LOCUST HEDGE.

Mr. Wm. Nunn, Afton, Iowa, made an inquiry in relation to the honey locust. Some say it is troubled with the borer, others deny it, and say it is the black locust that is so affected.

Mr. N. C. Meeker.—The objection against it as a hedge is, that it grows into a large tree, and its thorns are dangerous.

Mr. Wm. Lawton spoke highly of buckthorn and hawthorn hedges, and thought we ought to import plants from England; he had a small hedge, old and doing well.

Mr. A. S. Fuller said, these varieties were tried one hundred and fifty years ago, and thousands of bushels of seed had been imported, but they were so subject to disease and attacks of borers they had to be abandoned. The barberry makes the handsomest and best fence of all the hedge plants.

Mr. N. C. Meeker thought the Osage the best hedge for Iowa.

Mr. Thomas Cavanach said it would be likely to be killed during cold weather.

Mr. N. C. Meeker said that would make no difference, for it would sprout up and the dry thorns would be a perfect protection. In Central Illinois, where these hedges took fire from railroad sparks in the winter, they were not injured. Still, if the weather is so cold that mulching will not save the roots, barberry should be planted.

### OSAGE ORANGE AND WHITE PINE HEDGE.

Mr. J. W. Brown, Johnson's Creek, Niagara Co., N. Y.—I would like to find the best way to make a hedge of fifty rods; what kind of land is best for white pine, and how it should be cultivated.

Mr. N. C. Meeker.—The best way to raise the hedge is to get the plants of some Rochester nurseryman. If they have not a supply, send to F. K. Phœnix, Bloomington, or M. L. Dunlap, Champaign, Ill. Niagara county is rather cold for the Osage. The barberry would be sure to succeed, it is equally a protection, and is very beautiful, but it requires two years longer to come to maturity. Raise plants from the seed in a fine seed bed, and in rows. To raise the white pine as recommended in this reporter's farm item, get the seed from some seed store, have a nice seed bed, and raise the plants. This is a business requiring knowledge and care, and one should get Fuller's Forest Tree Culture. One may fail for want of going rightly to work, but, if he is young, he should no more give up than give up breathing.

### TO SPROUT OSAGE ORANGE.

Mr. J. Grimes, Afton, Union Co., Ohio.—What is the best way to sprout this seed preparatory to planting?

Mr. N. C. Meeker.—First, have the ground well prepared, but do not mark out till entirely ready to sow, for the seed should go into fresh soil. Moisten the seed in warm water, so that it will be thoroughly wet; then place in a bag where they will keep warm and moist, and in from twenty-four to thirty-six hours they should show signs of sprouting. Then plant immediately. They should be well watched, and everything should be kept in complete readiness. If a rain, unexpectedly, should prevent sowing, they may remain twenty-four hours without much damage, till the sprouts show well; but they will require careful handling. They of whom seeds are bought, should furnish printed directions. Still, some farmers save their own seeds.

### DETAINING THE RIPENING OF FRUIT.

Mr. Wm. S. Carpenter exhibited twenty-five varieties of the choicest pears now cultivated, all of which appeared as fresh as when they were plucked from the trees in September and October. He said the subject of the detention of fruit has attracted much attention for the last fifty years. Men of science and fruit-growers have investigated the subject in all its practical bearings. But until within a short time past—a few weeks at the most—have the investigations of science been adequate to the detention of the ripening process of apples and pears. Numerous experiments have been made with ice in the detention of fruit; but, as a general rule, the results were so unsatisfactory that they were seldom repeated the second time. A temperature of forty degrees was as low as could be obtained by means of the best constructed ice arrangements. This low temperature would arrest decomposition for a short period. But the constant evaporation of moisture from the fruit, which filled the fruit-room with dampness, would soon cause the fruit to decay. At Cleveland, Ohio, for many years, there was engaged a spirit determined to work out a problem which was to arrest the natural decay of some of our most delicious fruits, and to preserve them with all their excellence. After years of experiments, Prof. B. M. Nyce was prepared to proclaim to the world that he had discovered agents which would arrest decomposition of our most delicate fruits. Coldness, dryness, purity of air, absence of light, uniformity of temperature, exclusion of oxygen, the great agent of decomposition, and the immersion of the fruit in an atmosphere entirely harmless to it, make up, when combined in suitable degrees and proper proportions, all the known requisite conditions for keeping fruit. This fruit-house invention, by Prof. Nyce, holds the fruit as it finds it, and keeps it in a state of complete quiet, leaving it undisturbed by any agency beyond itself. The temperature of the house is held at near thirty-three degrees throughout the year. This remarkable evenness of temperature is in a great part the result of very perfect walls, doors and floors. Strawberries, blackberries and raspberries can be held for six weeks, without changing their condition, in such a fruit-house. Oranges and lemons can be kept from three to four months; plums and cherries for several months; peaches for one month; apples and pears for many months, and some of the late kinds, probably, for a year or two. Our experiments with grapes prove that the Catawba is the best keeper of all. These can be held until grapes come again. Experiments are now being made with fruit, meat and vegetables. In a great city like New York, this preserving principle will be of incalculable benefit. Heretofore only the opulent could enjoy the luscious fruits out of season; but we trust that the humble laborers will soon have within their reach our best fruits throughout the year. Europe will be frank to acknowledge that to American genius they are indebted for the scientific discoveries of determining the ripening process of fruits, and their complete preservation, on principles strictly philosophical.

Mr. P. T. Quinn.—I regard this discovery as one of great importance and value. It will place the most delicious fruits on our tables in January and February as fresh and delicate in flavor as when first plucked. I see here pears of great delicacy of flavor, looking as well and tasting as delightfully this 28th of January as when first plucked from the tree last August. I congratulate these gentlemen on their discovery, and think the whole community has reason to be thankful for the prospect of having Bartlett, Seckel and Duchess pears six and seven months out of season.

### FLORIDA FRUIT.

Mr. Pierre Odell, of Westchester county, N. Y., showed two monstrous lemons, two nice oranges, and a banana blossom, which he himself had recently plucked from the trees in Florida.

Mr. J. B. Lyman read the following paper on

### THE PASTURE LANDS OF THE SOUTH.

I speak to-day of a wide extent of country little known, less developed, yet unsurpassed on the continent for the pefection of its climate and the beauty of its scenery. It is the region of the southern half of the Appalachian range, commencing in West Virginia, including nearly half of that State, and a fourth of the adjoining State of Kentucky. As the traveler passes south he finds the eastern third of Tennessee of the same general description, the western fourth of North Carolina, and a large fraction of the northern half of South Carolina, Georgia and Alabama.

This elevated region supplies the mountain springs that feed the great streams of the southern half of this republic. Amid the wild and lonely hills of Western Virginia, the two Kanawahs rush northward over rocky beds and pour into the Ohio. A few miles south of the head springs of these streams the mountain brooks, confluent in those remote and picturesque valleys, roll southward, those on the western slope of the Cumberland mountain forming the Cumberland river and the streams of the central valley, collecting the rainfall of the eastern slope of the Cumberland and the western side of the Allegany ranges, uniting in a stream broad, deep and placid, which, at a distance of two thousand miles from the Gulf of Mexico, has a depth of water enough to float a man-of-war. On the southern and southeastern slope of this high land the rivers of South Carolina, Georgia and Alabama take origin, while on the east and northeast we find the head waters of the Roanoke, the James and the Shenandoah.

This broken county is very extensive. It includes thirty thousand square miles of Virginia, twelve thousand of Kentucky, fifteen thousand of Tennessee, twelve thousand of North Carolina, twelve thousand of Alabama, twelve thousand of Georgia and seven thou sand of South Carolina, in all a hundred thousand square miles; somewhat more than twice the whole area of the State of New York, and more than twenty times the area of Connecticut. The valley of the Tennessee may include a hundred thousand acres of low, and to some extent, alluvial soil; but, with that exception, the whole of this wide region is mountainous, wild, undeveloped, and very sparsely populated.

It consists of three sierras or ranges of mountains, the Alleghany in the middle, the Blue Ridge on the left flank and the Cumberland on the right. In this order the Appalachian range sweeps in a southwesterly direction, from the head waters of the Hudson on the North to the head waters of the Alabama, afar in the sunny South.

The tide of migration from the old settlements of the seaboard, rolling westward, never paused among these mountains. The great continental valley, with its deep soil and humid atmosphere, its millions of acres, to be owned in fee simple for a dollar and a quarter each, was too inviting. Beside, the slave-owner must have a soil from which he could force returns by heavy and unskilled labor. Pastoral and mountain races have ever loved personal freedom themselves, and respected the love of it in others. Moreover, these mountain sides and high plateaus would produce neither cotton, tobacco, hemp nor paying crops of Indian corn. For these reasons, the emigrants regarded all this country as a wilderness that separated the old home on the seaboard from the new plantation in the valley of the Mississippi.

A few lingered by the way. Many a lovely landscape caught the eye and won the heart of the westward bound. Noble springs of pure water, and deer bounding up the oak and chestnut-covered slopes, attracted hunters, but nine out of ten kept on, and settled a hundred miles beyond these picturesque and salubrious pasture lands of the South.

A well-marked difference is observed in the general formation of each of these ranges. The Alleghany mountains are two or three thousand feet higher than either the Blue Ridge, on the one hand, or the Cumberland range on the other. They are mountains proper, with the steepness, the rocky sides, the lonely and sterile summits, the heavy and sombre clothing of hardy evergreens, which distinguishes Alpine scenery. Blue Ridge is for the most part a line of well-wooded and cultivable hills. But the Cumberland range differs from each of the others. It is neither a line of solitary mountain peaks, nor a range of forest-crowned hills, but a broad plateau of table land lifted two thousand feet above the sea level. It is to this plateau of the Cumberland, as it appears throughout the State of Tennessee, and in the Northern part of Alabama and Georgia, that I would invite the attention of the Club, as affording one of the most attractive regions, for a large class of settlers, of any section in the Great Republic.

Several circumstances combine to give the region of which I speak a climate of unsurpassed healthfulness.

You observe that south of Mount Mitchell, in North Carolina, the Alleghany range falls away, the peaks losing height, till in Northern Georgia they should be spoken of rather as bold hills. For this reason the warm breezes from the Carolinas and the Gulf coast are not interrupted as they are in that part of the range which stretches through Kentucky and Virginia. There is a group of hills in the southern part of Kentucky from which the northern tributaries of the Cumberland river flow, which shields this plateau from the sweep of northwest winds. Its elevation is moderate, in no case exceeding two thousand feet. It stretches from northeast to southwest in a southern latitude, the lower or southern edge of this plateau being not over two hundred and twenty miles in a right line from the Gulf of Mexico. It is at such a distance from the sea, and from the waters of the great valley on the west, that the rain clouds are often partially discharged before they drift that far inland. Hence the rainfall, though sufficient for agricultural purposes, is not excessive.

The atmosphere is pure, dry and balmy. The average summer heat is about sixty-five degrees; that of winter cannot fall much below forty-five degrees. There is no point east of the Rocky mountains where the variation from summer heat to winter cold is so moderate. There are few days in summer when the heat drives the laborer to the shade at noontide, and few in winter when he requires an overcoat in going to his woodland labor.

Snow frequently falls, but it seldom remains a week on the ground, more often disappearing in three days. Frost rarely penetrates over three inches deep, and there are several times each winter when none remains in the ground for two or three weeks. As in other elevated regions remote from the ocean, the contrast between midday and midnight is more noticeable than the contrast between January and June. During all the early part of June, and for a part of August, a little fire at nightfall and in the morning is agreeable. Yet, the days of January are rare when the midday heat is not such as make some indifferent to the closing of a south door, or a window looking toward the sun. There is never a raw and chilly wind, as on the Atlantic seaboard; never a succession of damp, gloomy days when the moist wind, just above freezing point, makes a thick overcoat as necessary in Mississippi as in Maine; nor, on the other hand, is a succession of mellow, vernal days, in January or February, succeeded all of a sudden by a north wind which drops the mercury to zero, drives everybody to the fireside, and kills all the peach trees, as so often occurs in Kansas and Nebraska.

As before stated, this mountain region is not suited, either as to climate or fertility, to the growth of heavy crops. The soil is a light, gravelly loam on the slopes, and of a dark, peaty character in the glades, or small prairies which are interspersed at irregular intervals through the forest. The natural growth is black oak, pin oak and some white oak, a good deal of chestnut, a little hickory, rather more of yellow poplar, some white pine on the banks of the creeks. Close by the water there is an undergrowth of laurel and hazel bushes, but in general the woods are so open that a wagon can be driven anywhere. A tall, wild grass, coarse, but quite nutritious, abounds everywhere. If there were animals enough to graze it down and keep it tender, it would be good all summer. But in August it reaches such an age and size that woody fiber is developed, rather than starch and the juices, and the cattle refuse it if they can find tame grasses. The plateau to which this description applies is, on an average, thirty miles wide and two hundred long. Its surface is not a monotonous level, but undulates, in some parts being cut quite abruptly by percipitous ravines, and in others rising into knobs or swells a hundred feet in height. A considerable part of the surface is occupied with grassy meadows or glades, nearly destitute of trees, which by proper cultivation could be developed into good meadows—cutting a ton and a half or two tons to the acre. As indicated in the title of this paper, this is designed by nature as a pastoral region. The winters are so mild and open that sheep can keep in condition all winter with very little attention. The hardy wethers generally seek remote and sheltered hollows, where they find picking all winter. The ewes and sheep not born on the mountain, come around the house, and need a little hay on snowy days. But the dogs and wolves kill more than perish for want of food in winter. Neat stock require fodder for about three months; but for half that time they will make the most of their living in the woods. As a general rule, a farmer may feel safe if he enters on the winter season with as many tons of hay as he has horned cattle and horses, the latter, of course, receiving some grain, as also the milch cows. I think ten tons would take two hundred sheep from December to March. In short, the difference as to wintering animals may be understood by taking the three severe months out of our winters, and joining the last of November to the first of March.

The soil appears to be wanting in lime and also in ammonia, but is not very defective in potash. Wheat does not do well. Rye heads and fills well, but the stalks stand thin. Potatoes and all the roots do well. It is the chosen locality for fruits. Late frosts in the spring are very unusual, so that peaches are almost as regular a crop as blackberries, and in many places as plentiful.

Fall and summer apples thrive. The trees grow to a large size and produce well. But south of the Ohio, it has as yet been found impracticable to attempt winter fruit. All the vines and small fruits flourish in this hilly region. As the autumns are long and quite rainless, grapes can remain on the vine till late in October or early in November, and thus draw larger supplies of sugar from the air than is possible in a climate where killing frosts may be expected early in October. The woods abound with wild grapevines, and these are generally productive, some years being loaded so that many bushels can be picked from one vine. Peaches bear on the third year from planting, and the crop is surer than in any other part of the country. On account of the remoteness and difficulty of access, the peach crop is dried in kilns, or fed to hogs, or made into peach brandy.

The first method of disposing of this delicious fruit makes drudges of the women, and the last makes brutes of the men.

I have never seen good red clover on this soil, and doubt whether it can be grown without a liberal use of lime. But on the low prairie and swampy lands, foxtail, herds grass, orchard grass, and timothy are easily produced. These low lands, where grasses will grow, may compose one-sixth of the surface of Cumberland Plateau. Sorghum is one of the most lucrative of the crops that can be cultivated here. The late, mild autumn permits the juice to become very sweet. Its growth had become so extensive before the war that New Orleans molasses had no sale.

The true policy in farming in such a locality is to supply nearly all the family wants from a few acres near the dwelling, and to look for the principal income from the sale of bullocks and of wool. Samuel McRunnels, a farmer of long experience in this region, informed the Commissioner of Agriculture that a two-year old steer or heifer could be produced at a cost of from three to five dollars. He sent away to the seaboard markets from seventy-five to a hundred every fall. Granting that it cannot be done for less than ten now, such animals would sell in the fall for thirty dollars, giving a profit of twenty dollars each, or $2,000 on a herd of 100 head.

There are several reasons why I regard any efforts that look toward the settlement of these pastoral regions as judicious and timely.

1. They are the only parts of the South that have not been unfavorably affected by the war and by the dispositions that war has produced. These hills and mountain tops have never been damaged by the system of cultivation which was universal wherever the soil of the South was tilled by compulsory labor. The few settlers on these slopes or these high table lands were poor and owned no slaves. Most of them were opposed to slavery on principle, and therefore fought secession on principle. It is the only part of the South where to be an advocate of the policy of the present Congress does not attach more or less of a stigma to a man's character. Neither has the reconstruction policy affected society in these mountainous parts. There were no rebels to be disfranchised, no blacks to be enfranchised. Hence, no matter what have been the political antecedents of a settler, he is welcomed.

2. These lands are very cheap. On an average they are lower than Government lands. Thousands of acres can be bought for twenty-five cents. Choice tracts can be had for two or three dollars an acre. If one desires to unite grain farming with grazing, lands in the river valleys, rich in lime, and growing fine crops of wheat, clover and corn, can be had from five to fifteen dollars an acre.

3. It is the only part of the Southern territory which I consider as healthful and as well calculated to produce physical and mental vigor as any part of the continent. The low lands of the great Southern valleys are malarious. The liver of the Anglo-Saxon remaining in such climates becomes torpid, his complexion muddy, and his disposition indolent. That is the great objection to the Florida climate. The air is so mellow and balmy, the temperature so uniform, and the scenery so tame, that one might as well abandon all strenuous industry, and become a Turk or Lotos-eater. The climate woos one to indolence, and has no stings of frost and hunger with which to punish laziness. Not so, however, with the highlands of the South. The air is pure and bracing, yet mellow; and there are in the pastoral regions of which I speak, no local causes of any sort which produce disease. The heat is not such as to derange the liver of a white man. The air does not irritate weak lungs and sensitive bronchial tubes. There are no swamps to produce bilious fever, no ships to bring yellow fever, no filth of cities to breed cholera. Disease sometimes invades these favored regions, but it can generally be traced to bad food, or the practice of sleeping in small, close rooms.

4. Migration to such regions should be encouraged for higher reasons than any I have yet named. On such lands it is not so easy to acquire wealth as on fatter soils; but it is easier to achieve independence from the demands of accumulated capital, and urban luxury; easier for the honest though unpolished farmer, amid the hum of bees, the bleating of his flocks, and the lowing of his herds, sitting beneath his own vine and peach tree, breathing a balmy air, and gazing upon a lovely landscape,, to feel a repose of heart and a cheerfulness of spirit; to cultivate a love for man, a devotion to his country, and a reverence for his God, unknown to him who looks upon the teeming growth of a rich plantation simply as affording him the means of commanding city splendors and satisfying a host of fictitious wants.

At the conclusion of this paper, the thanks of the Club were tendered to the author.

## SEED SOWER AND PULVERIZER.

Mr. Amos Newell exhibited a new agricultural machine, called "The Sower and Pulverizer." It consists of a shallow pan fastened between the shaft of the sulky and under the feet of the driver, with a gauge regulating the rate of discharge. It casts the seed evenly upon the whole space between the wheels. Behind, and operated by cogs on the wheels, working by two shafts that extend several feet behind the driver, is a cylindrical harrow, the teeth of which plunge in the earth and work it fine. This machine took the first prize at the recent exhibition of the American Institute.

Mr. Wm. S. Carpenter said he had seen the operation of the machine, and that it works admirably, whether on old land or on a fresh turned sod. He saw it operate in a field where turnips were growing, after potatoes had been dug. It dug the turnips very rapidly, and left the surface in fine condition.

### REPORT ON FELL'S SULKY COTTON PLANTER.

The committee designated to report on the above-named implement stated that the machine consists of a two-wheeled cultivator, or gang plow, having a seat for the driver and four small plows so arranged that two furrow slices on each side are turned toward the drill or row of cotton. The machine is drawn by two horses or mules, and plants one row at a through. A small steel-mounted tooth in the middle of the implement opens the channel for the reception of the seed, which is dropped close behind the tooth in the bottom before the mellow earth falls back into the channel. An iron cover attached to the rear of this tooth buries the seed with mellow soil. The seed is forced out of the distributing orifice by means of a distributor similar to the pod of a carpenter's auger, which is made to revolve in the issue, like an auger turning backward, while the pod is still in the hole. The cotton seed is thus forced downward through the bottom of the seed box, in uniform quantities, just as the chips that an auger makes, are worked out of the hole which an auger bores. Judging from such an examination as the committee were able to make without a trial in the field, this combined seed planter and cultivator will be found a valuable implement for cotton growers. The committee see no reason why such a machine should not operate in a most satisfactory manner on prairie soil, or where the land is free from stones and roots and stumps and other obstructions.

### MOWING MACHINE KNIFE GRINDER.

Grinding the sections or knives of mowers and reapers is a job that cannot be performed satisfactorily on an ordinary grindstone, while the cutter bar is held in the hands. To obviate the difficulties heretofore encountered, Messrs. Richardson & Co., Auburn,

N. Y., showed a small model of a device for holding the cutter bar in the best desired position for grinding the basil of the sections at a uniform angle.

Mr. Wm. H. Field, Portchester, Westchester county, N. Y., brought in a full-sized machine, with grindstone, cutter bar and all, and showed its operation, which was received with eminent satisfaction, as a boy or unskilled laborer can grind the knives with such a device quite as well as a skillful mechanic. The grinding is done on the side of the grindstone, instead of on the periphery. The cutter bar is held in a frame, and one side of each knife is ground at once.

### HEXAMER'S PRONG HOE.

Dr. F. M. Hexamer, Newcastle, N. Y., exhibited one of his prong hoes. It differs from all other forks in the manner in which the tines are inserted. There is a socket through which the double tines are slipped and held in place by an iron key. In very hard earth, or for handling heavy manures, two prongs are enough. For digging potatoes and many other purposes, four prongs are best. For working light soils, two more can be added. If one limb or shaft of a double tine breaks, it can be taken out and mended more perfectly than when the ordinary fastening is used.

Mr. Wm. S. Carpenter said he had used one for some time, and found his hands can go over the ground twice as fast as with the common hoe, and stir the ground much deeper.

Mr. A. S. Fuller spoke to the same effect, praising the prong hoe. He thought it was superior to every other instrument for clearing the earth of small roots. Adjourned.

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## February 4, 1868.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### IRON AS AN ANTIDOTE FOR THE POTATO ROT.

Mr. James Warren, of Monroe, Jasper county, Iowa, who in June last sent a communication to the Club on "Potato Culture," now submits his views on the use of iron as a preventive of the rot. Protoxide of iron plays an important part in vegetation when present in minute quantities, but not in the way the writer supposes, by exciting electricity. Still, his paper contains some thoughts which are very suggestive, and will repay perusal. After a few words of introduction, he proceeds as follows:

During the life of every potato plant there should be progressive development, from germination to maturity; ever having a positive tendency to perfection, in accordance with the intelligent design of the vital principle, and under its domination. There is some margin in which negative tendencies are tolerated, and in which recuperation is possible, but beyond that margin is death and decomposition.

A potato plant of a given variety should have its components in certain proportions, and those proportions should be intelligently modified and distributed to its constituent organs, according to their respective requirements. The same balance of proportions should be common to all plants of that variety, at an equal stage of development. Any superfluity or deficiency creates disturbance, deterioration and negative tendency. When a potato plant has successfully progressed through all the stages of natural development, and is fully ripe, then it is perfect, and not otherwise. Then inhalation ceases; evaporation of aqueous vapor commences; the vegetable juices thicken and recede; circulation stops; the calix hardens; the leaves wither and die; then dry up the stem, from the apex downward, and the roots, from their extremities. As this withering process advances by evaporation, there is a determination of the thickening juices to the tubers, laden with material intelligently designed to be garnered up for the succeeding generation.

In this place, I wish to call your attention to the fact that iron plays a very important part in the growth of potatoes. And when the ripened plant dries up and dies, as just above stated, the major part of the iron of the whole plant, in combination with other substances, is driven into the tubers for future use. If the product of potatoes has been augmented by cultivation, the shares of iron to be stored in the respective tubers must be below the natural requirements.

A cycle of the vital principle remains with each tuber to preserve its germs and stores until the season comes around for a renewal of activities. If when we plant, the temperature and humidity is equal to the requirements, the operations of nature commence. The germ expands, and presently draws sustenance from the stores in the set. Rootlets put out to seek nutriment in the ground, and the sprout struggles upward to gather treasures from the atmosphere and the light.

As the growth proceeds, the set delivers up to the young plant all its valuable stores, the iron amongst the rest. By the time these stores are transferred, the plant should be in a condition to cater for itself; but if these should be out of their natural balance of proportion, the young plant will be affected and have a negative tendency. That is what is the matter—there is a deficiency of iron.

It never was the intention of nature to produce such heavy crops of potatoes, in a wild state, as man has been in the habit of obtaining by cultivation. If cultivation had been carried on understandingly from the first, the potato would have retained its health and vigor, and there is the strongest probability that the yield of these latter years would have been greater than ever before, whereas the reverse has been the fact. It should be borne in mind that cultivation is not only exhaustive of soil, but also of the vitality of plants, by disturbance of the natural balance of proportions; hence the necessity of readjustment and modification, from time to time, by the cultivator. If nature is to supply *extra yields* for the use of mankind, *man* must supply the *extra means.*

The uses of iron in the potato plant are multifarious. It is to the plant as moneyed capital is to man; it is the medium through which the most important exchanges and transactions are continually being made and carried on; such as decomposition, combination, involution, evolution, &c. It aids in the decomposition of the atmosphere, and of light, and gives a character to the sap which facilitates the conduct of heat and electricity through all the ramifications of the plant.

Every farmer has observed how, after a shower of rain, the plants all stand up erect, as high in air as practicable. Wherefore? To obtain their requisite share of electricity; if the sap is in healthy condition, they obtain it. If there is a deficiency of iron, the electricity finds readier conduct by the humid vapor rising from the moist earth. This is why deteriorated potatoes have an extraordinary tendency to rot in wet seasons, and on low lands. This is one reason why the ground should not be stirred much, when potatoes are in blossom, as the rising vapor interferes with the decomposition of light on the blossom; and so retards or hinders the production of healthy pollen, for the stigma, and frustrates the elaboration of perfect seed.

If fructification is duly consummated, each branch bears its cluster of seed balls, and the whole plant ripens; but if each effort to produce seed proves abortive, there will still be persistent efforts to do so, each effort being more feeble than the former; even the unripe tubers will make the effort sympathetically, and so produce after growths, and oftentimes send up new sprouts and continue doing so, until the whole is prostrated by frost.

Now, the potato, being originally an exotic, nature has not provided for that contingency (frost), and so, when the plant is suddenly cut down, in this manner and condition, all of those substances contained in the parts stricken down, and which, after a healthy growth and maturity, would be conservated in the tubers, are irretrievably lost.

When dug, the best are taken to be eaten, and the refuse left to plant; and in this way we have been going on, year after year, adding deterioration to the deteriorated, heedless of simple facts, attributing our failures to fungus, animalculæ, &c., the presence and existence of which are simply resultant of a negative tendency, and legitimately consequent upon our own mismanagement.

You have had repeated testimony of the fact that nails, driven into the branches or trunks of barren fruit trees, induce fruition. One man declares he has enlarged his melons by sprinkling the vines with a solution of copperas, and it is pretty generally known, that grain soaked in that solution just before sowing is rendered less liable to smut; and why? It is not on account of its destructive qualities exerted on animalculæ—as some people think, but that it induces a healthy flow of electricity which invigorates the plant or tree, enables it to obtain its needs from the elements, and promotes a positive tendency under the intelligent domination of the vital principle.

What then shall we do for the potato? I say, carefully read and digest my former communication in connection with this, which is supplementary and put in the iron. This may de done in various ways, the best way must be determined by time and experience. A simple way is to thrust a fourpenny nail into each set and let it remain, or to cause a powder of copperas and lime to adhere to the newly cut set. Still another: put some oxide of iron into the ground, where and when you deposit the set.

And now I would ask, does the Club attach sufficient importance to what I have advanced, to induce them to subject it to a full and fair test?

### A LARGE PEAR TREE.

Mr. S. Burnett, Vincennes, Ind.—Twelve miles above here and three miles from the Wabash river, stands the stump of the Occletree pear tree, which was healthy ten years ago, and stood sixty-five feet high, the top speading over seventy-five feet around. The body was ten and a half feet in circumference around the smallest place below the limbs. It was brought from Pittsburg and planted here in 1804, by Mr. Occletree. It stood alone, grew rapidly, and in 1837 bore one hundred and forty bushels of pears. Four years ago several of the principal branches were broke off by a storm, and the remaining one, although it fruited last year, is fast going to decay.

### LIME ON LIMESTONE LAND.

Mr. David Howard, South Shaftsbury, Vt.—Is lime of much benefit for limestone soils?

Dr. Isaac P. Trimble.—I find that it does more good on this kind of land than on any other. I have tried it on my place, where there is no limestone, and it is of no benefit whatever.

Mr. P. T. Quinn.—I use burnt-shell lime in preference to any other.

Mr. Wm. S. Carpenter.—Lime will do well on retentive sour soils, but not on sandy land.

Dr. Israel Jarvis.—On the sea coast lime is more effective on account of the salt, than in the interior.

### CULTIVATION OF CRANBERRIES.

Mr. A. Hollister, Hollisterville, Wayne county, Pa.—I give you my mode of raising cranberries. The land is a narrow neck between two small streams, with high banks on either side, and was never plowed. It is a sward and gravel subsoil, covered with from four to six inches of laurel and hemlock muck. I got the plants from a natural marsh of wild cranberries, by cutting them out in large sods and separating them and setting about a half dozen vines in a place three feet each way, by striking into the muck and inserting the roots in the soil beneath. I think the muck protects the roots from drouth, and keeps the weeds from growing. I have three-quarters of an acre which I cleared from heavy hemlock timber, and burned the ground over to kill the laurel roots, in 1862, and planted about one-third of the piece in the spring of 1863, and the remainder in the spring following. The first set now covers the ground; they have had no attention except keeping the briars and dwarf-elder out, which are the only things which come up through the muck. I gathered thirty bushels last gathering, notwithstanding a great part of the land is covered with stumps. The fruit grows as large again as it does in a wild state. The vines send out runners from two to three feet each year until the ground becomes covered.

### CIDER VINEGAR.

Mr. S. Burnett, Vincennes, Ind.—In September, when my apples begin to fall, I make them into cider. Taking a barrel of fine cider vinegar, I draw off one-half of it and fill up the barrel with new cider. In six weeks it is ready for market. In cold weather it requires more time. Old vinegar and a sour barrel will be certain to do the work if the air can have free access to the contents.

Mr. A. Tufts, Centralia, Marion county, Ill.—One year ago last October, I made a barrel of cider, put a bottle in the bung-hole, and placed it on the south side of a building exposed to the sun. In a week I drew it off very slowly (to expose it to the atmosphere) into tubs, let it remain four hours, and returned it to the barrel. Ten days after I repeated the process, and when it was seven weeks old I sold it to a grocer for good vinegar, and it was good, an article very seldom to be bought at the groceries. I did the same thing several times before, with the same success.

### CLOVER.

Dr. J. E. Snodgrass read the following paper on clover as a fertilizer in the Shenandoah valley:

Inquiries are not unfrequently made by the "outside members" of the Club, as we sometimes designate our more constant correspondents, concerning clover as a fertilizer; and when the subject of this plant is thus brought up for discussion, questions touching the management of it have been put, by some of the most intelligent of our inside members, which denote a want of light on it by not a few otherwise well-informed agriculturists in this section of the country. Under these circumstances, I have thought it might be well enough to put on paper some of the results of my own experience, as a farmer in the Shenandoah valley, and of my observation in other portions of the country, where what is known in the South as red clover, is generally used as a fertilizer, as well as a food, with unquestioned success.

Years having elapsed since the facts of my experience were gathered, I thought it safest to be reassured, and therefore I opened a correspondence with my farm overseer, or farmer, as he would be classed in the North (Mr. Jacob S. Strayer, of Martinsburg, in what is now West Virginia), and also with another gentleman—to be named hereafter—who is equally intelligent, while long-experienced in agriculture in that neighborhood. Of the information afforded me by these correspondents, I propose to make a free use in this paper. In doing so, I shall endeavor to follow their excellent examples, and confine myself to matters of fact.

First, then, as to the proper season for sowing clover, the quantity of seed to the acre, the best time for curing hay, etc.

The proper season for sowing will, of course, depend more or less on the locality, to say nothing of the variableness of the weather in any given spot. Hence, I shall content myself by giving the Virginia dates for this and other steps in clover culture, which do not vary much from those preferred in Maryland, Delaware and Southern Pennsylvania, and which may serve as a general guide—premising that the difference in the season for spring sowing and planting is at least three weeks later in this section of New York than in the farthest southward locality in reference. Spring is the proper season for sowing, and the usual time is from February to April. It is very common to sow it on the snow, which some farmers think calculated to facilitate the germination of the seed, and the firm rooting of the young plant.

The best condition of the soil is, when it is bearing a crop of winter wheat or rye (spring wheat is not practically known in the States named). The cereals protect the clover until it gets a start, so that, so soon as the grain is harvested, the young plants shoot up with a growth too vigorous for injury from even the scorching sun of July, by the memorable fourth day of which most of the wheat and rye is cut, in order that (in Virginia, particularly, according to the custom which used to prevail), all hands may attend the *barbecue*, black as well as white, and eat of the big ox, and drink of the rye whisky, which was sure to be furnished plentifully, to the slaves as well as the poor whites, to wash down the half-roasted beef, and to knock the drinkers down, or stimulate them to perform that friendly office in the midst of a general row, by way of giving proof that the alcohol is no respecter of persons, and that the fourth of July is a day worthy to be held sacred—in which after-harvest innocent amusement, I am sorry to be obliged to testify, in passing, even the masters, especially the "young massas," occasionally took a part!

The quantity of seed is usually about one gallon to the acre, costing only from seventy-five cents to one dollar and twenty-five cents. The supply for the Shenandoah Valley, in the boyhood of the writer, came in good part from Pennsylvania, because the improvidence and slovenliness of slave-culture rendered it more economical (as short-sightedness seemed to suggest) to buy than to raise clover seed. But, for many years before the war, the home supply was more than equal to the demand, as will be inferred from the statement that the usual yield is from two to three bushels per acre, while, as testified by one of my correspondents, Mr. Strayer, as much as seven bushels have been raised on a single acre of ground, or enough to re-seed fifty-six acres. Since the operations of Sheridan and Early, to say nothing of Stonewall Jackson and Fremont or others, in that interruption to the peaceful art of husbandry which the tramp of hostile battalions brings, to say nothing of its destructiveness, the supply is now, in many parts of the Valley, short of the demand for local use.

For the perfection of the growth of red clover, two years are requisite. The plant rarely attains to any considerable growth before the fall frosts. The following spring, having the field literally to itself, it is pushed forward vigorously, under the treatment to be named presently, and is ready for the scythe by the middle of June, or, at farthest, the twentieth of that month, varying with the run of the seasons. The indication of readiness for harvesting is the brown tinge assumed by more or less of the, until now, so brightly blooming and inviting odoriferous flowers of this truly beautiful as well as useful plant. When a good yield of seed is desired, it is better to pasture the clover till about the first of June, and not mow it at all. The seed is furnished by the renewed second year's growth, which follows either the cutting or pasturing process; and, to obtain it in perfection, the seed crop should be secured in August, from fields which have been used for pasturing, but at least a month later in cases where the scythe has done its later and lower cutting—for the plant is not checked, in its seed-bearing tendency, so much by the cattle as by the mowers. The stand of clover from which two crops have been cut, with the view of securing hay and seed both, will not prove so good a *fertilizer* as when one or both of these mowings have been omitted, and, for pasture, the third crop is not adapted. It is apt to cause that action on the salivary glands, known as "the slabbers," by which the health and strength of horses particularly are literally drained off, for I have seen that noble animal reduced almost to a skeleton by it. But on well regulated farms, the sward is usually turned under so soon as the seed crop is taken off, and fallowed preparatory to seeding the ground in wheat or rye. When the purpose is to use the crop as a fertilizer, it is deemed best to pasture rather than harvest it, and to plow the clover under in a greener condition than when mown for winter use as hay. This precaution preserves the succulence of the plant, and with it more of the fertilizing qualities of the leaves and upper stems, and more or less also of the blossoms, which escape the carping of the cattle to some degree. Three successive annual crops of a full average yield of the cereals may be relied on as a return for a single crop of red clover which has been turned under green in this way, provided the land is in fair condition when clovered—a fact which ought to be sufficient to convince the most skeptical of the great value of this grass as a fertilizer.

If the farmer desires to have clover reproduce itself for any considerable number of seasons, he must let the seed ripen in the second year's growth, and fall uninterrupted by either mowers or cattle. Then he may anticipate what is called a volunteer crop as recurring for an almost incredible series of years. As an example of this result, my correspondent, Mr. Levi Henshaw, already alluded to, writes me as follows: "I have a field that I planted ten years ago, and I have put no seed on it since, and yet I have the prospect of a good crop of clover at this time (January 20th, 1868). Since I sowed it down, I have raised on the field three crops of corn two of wheat, and one of oats."

Mr. Henshaw's rotation of crops in securing these remarkable results from a single seeding of this fertilizer—for they will be remarkable even to some persons who are more or less conversant with the history of this grass—was as follows: "I plowed in the clover (in the early fall, of course, while the plant was still juicy), and planted the following spring in corn. So soon as I cut off the corn, I seeded with wheat. When cutting my wheat, the following harvest, I found the field so well set in young clover that I let it lay in clover the succeeding year. After it had laid in clover one year, I plowed it in the spring, and again planted it in corn. I then sowed the corn ground in wheat (without rest), as before." Thus, Mr. Henshaw continued to keep this field in cultivation for two successive seasons, letting it lay in clover the third year, and repeating that routine until the present time—making ten years in all, with the prospect, as we have already learned, of a good yield of clover this season, to be turned under and planted in corn, rotated with cereals, for several years longer. It is true, the land which furnished this noticeable "field of operation," was "fresh"—that is, newly cleared. But, at the same time, it had no other manure but the clover, which sprung from that single sowing with only a gallon of seed to the acre, ten years ago—and all this, without doubt, having, for one of its profitable conditions, such plentiful yields of wheat, corn, rye and oats, as blessed the Shenandoah Valley for long years, ere the plowshare of war interfered with the plowshare of peace, in obedience to the behests of Mars rather than to those of Ceres, and as it is beginning to do again, without the risk of such another interruption of its peaceful pursuits in the coming years, let us fondly hope and pray!

Now, it should be borne in mind, as another important consideration of this fertilizer, that the years in which the above described field lay in clover, it was not unproductive and useless aside from the recuperative process which the clover's soil food was aiding it to conduct. To the contrary, crop after crop of clover either found its way into Mr. Henshaw's barn, in the shape of hay, to be converted into draft power, milk and butter, or flesh food, or left to contribute more directly to those ends, as the most delicious as well as the most nuitritious pasturage that farm stock could be permitted to have. And here let me say, that while it is admitted not to be so good as feed for horses, in the working season of farmers, as timothy, because of its containing less albuminous and nitrogenous or muscle-producing constituents than that also most valuable species of leguminous plant, while containing a much larger percentage of heat-generating carbonic acid; but in the comparatively idle season of winter, it is equally as appropriate, while more relished by them, as a continuous food. For horned cattle, and especially for milch cows, it is always preferable as a hay. Cows fed on timothy soon show a decreased activity of the milk glands, because it "dries up the milk" in dairy phraseology. Clover hay, on the other hand, to a great degree, though not so plentifully as the sugar-coated and honey-laden, full blown green clover, is an excellent milk-producing food. But not only so. The richness of the milk from cows fed on clover hay, to say nothing of its sweetness and general flavor, compared with milk from most of other winter food, leaving the swill milk of our Metropolitan stump tails out of consideration, is well known and duly appreciated by such as have had the good luck to encounter it in the clover region to which this paper relates. The writer has memories of it, running back to childhood, which, remembering the line of Pope, that assures us that where ignorance is bliss 'tis folly to be wise, he is very far from welcoming, when a love of the very name of "milk" betrays him, as it does sometimes, to put to his lips the white fluid called after that name, by courtesy, hereabout.

Clover is eminently a lime seeker in its habits, and had its birth place, so far as can be ascertained, in the calcareous soils of the East. It flourishes, therefore, most luxuriously throughout the great valley of which I have been speaking, whether on the south side of the Potomac, in what, since Phil. Sheridan took his rough ride through it, is widely and almost exclusively known as the Shenandoah valley, but which used to be known as the "Valley of Virginia," or that part of it on the north side of that now so classic river, where it sweeps through large sections of Maryland and Pennsylvania, with the designation of Cumberland valley, that magnificent agricultural section, passing through the clover fields, of which, in the month of June, as I had the exquisite pleasure of doing last year, ought to be sufficient to convince the most skeptical that the plant under notice is not overrated by me in this paper. When sown on land of the limestone formation just referred to, from the surface soil of which the naturally imparted properties of the lime rocks have not been all abstracted by vegetation, as is too soon and often the case by reason of unwise culture, growing as much out of a lack of chemical knowledge as a lack of energy, it then needs little or no manure, as we have learned from a statement of results already given. But even the richest land may finally be robbed of its more accessible constituents, by too long cropping with plants which find their appropriate food therein, so as to no longer grow them efficiently, because of everything being carried away from, and nothing returned to the earth.

To this rule the limestone soil under notice offers no exception; and when it has become thus robbed, there is no restorative, that is found to be so effectual as clover. Hence it is—barnyard manure always excepted—almost the sole dependence as a direct fertilizer. I desire especial attention to the term "direct," because it is the key to the philosophy of clover culture for either the restoration of worn-out lands in the Middle and Border States, or the increased fertility of other classes of soil. Clover is what, to borrow a term recently introduced by a certain new religious sect, might be called a "mediumistic" fertilizer, as generally relied on there; that is, it is found to have the power as well as the aptency for absorbing from the subsoil with its remarkably deep running and searching roots, and from the atmosphere with its thickly clustered leaves, not only what itself needs as food, but what the cereals and corn as well require. By imparting these indispensable constitutents when turned under for manure, it assures to the surface soil more or less of permanent richness, for its permanence as a manure is what gives it such a deserved preference.

A moment's consideration of the chemical constitutents of the cereals and of corn as well, would be sufficient to indicate clearly enough why clover is so sure a fertilizer for the lands in which it is desired to grow them. I will name lime as one of these to illustrate this position. Lime is an indispensable property of the cereals, and particularly of wheat; and clover contains a large percentage of it. This it gives out to the soil on decomposition in the fallow, and finally through it to the grain.

Lime, for the reason just stated, is in some form or other, the usual artificial manure relied on for clover. But, it is not applied in the usual form in which it is put upon the soil itself, that is, the carbonate of lime of the common limestone simply deprived of its carbonic acid by the heat of the kiln, but in that of sulphate of lime or gypsum, called plaster, as an abbreviation of plaster of Paris, which is, as you all know, the designation of the same article when used for building or artistic purposes. In my earlier farming days, plaster was carried in wagons all the way from Baltimore or Georgetown, to West Virginia, in lumps as large—many of them—as an ox's head, and reduced to powder in the country flour mills, between burr stones set wide purposely for it, after these lumps were broken to a size sufficiently small to be taken in between them. During my later visits to the clover region, I have missed the great piles of plaster that used to greet my wandering juvenile gaze, and I believe the material is, now, usually obtained ground and conveniently ready for use by the farmer as well as the artizan.

Plaster is generally sown upon the clover from one to two months after the latter—in May, for the most part—the clover being sown, as we have already seen, as early as February, sometimes. The quantity is usually about one bushel to the acre. I would advise a more liberal use on lands having little or no natural lime. To get the full benefit of this fertilizer to the clover crop, especially where land is deficient in lime, or on old and more or less overcropped limestone land, even the plaster should be duplicated the following spring, at about the same time as before.

While plaster is an excellent fertilizer, without doubt, I think it is not certain that the stimulating power it exerts upon the clover, and through it upon the grain crop, is because of the sulphuric acid which it contains, so much as of this latter agent's affinity for the water contained in the atmosphere, which sulphuric acid is known to attract more powerfully than any of the other mineral acids. I so reason, because there is really less than two per cent of it in clover hay, 1.85, while there is more than twenty-two per cent of *lime*, which is the base of plaster—22.62 being the proportion of lime found in it. And I raise the question here, whether by relying on the clover obtaining sufficient of the constituents of sulphuric acid from the atmosphere and earth, the powdered limestone unburnt (carbonate of lime), or slacked burnt lime, if sown upon clover instead of the plaster, would not, in very wet seasons, supersede the obtention of sulphuric acid from the gypsum. If so, what would seem to settle the question of the *modus operandi* of this valuable companion and assistant of the great fertilizer under consideration, without affecting its use, which I am very far from desiring to lessen.

When the subject of red clover was up before the Farmers' Club some time ago, the question was put to me: "Will it grow on all kinds of lands, and in all parts of the country?" I answer now, as I answered then, that it will grow on all *uplands*, as contradistinguished from wet meadow lands, or very sandy bottom lands, except those where there is unmixed clay—timothy being more appropriate for the exceptional soils named, because of its need of a much larger quantity of silica, about thirty per cent more than clover, while the latter is apt to be thrown out of wet land by the frost, as timothy is not, although even it is liable to be "drowned out," as the farmers phrase it, where there is much water, as in the flat lands of New Jersey, for instance. But, to further and more fully answer the question just quoted, I will state that I have seen clover growing well on a great variety of soils, and in a great many localities, including the once utterly worn-out and thrown-out slate lands on both the Pennsylvania and Maryland sides of the Susquehanna, now so productive under the clovering and liming and plastering system of culture, and also on both borders of the Ohio, not forgetting the once apparently hopeless lands on both sides of the Potomac, particularly in Prince George's and Montgomery counties, in Maryland, and Fairfax county, in Virginia, so praiseworthily rescued many years ago, in this way, by Nothern settlers, known as the "Yankees of Fairfax." Those of you who are old enough to have observed the woeful condition of the slave labor and tobacco-impoverished soil between Baltimore and Washington, thirty years ago, and again recently, must have noticed and wondered at the change in many of the fields, which now are as fruitful as the common run of lands. Well, clover and plaster—or *guano* instead of the plaster, which is an excellent fertilizer wherewith to start the more permanent clover on worn-out lands, and which only wants a place to sow it on, for that end—yes, clover has done it all, and in its magic touch alone is to be discovered the grand secret of the marvelous change, as the present United States Commissioner of Agriculture, Col. Capron, well knows, for he was one of the noble associates of the late Samuel S. Sands, of the *Maryland Farmer*, in the new era of agriculture in Maryland, and, indeed, on the entire border.

I have stated these facts in the hope of inducing such farmers as have not employed clover, to do so, because I think it has no equal as a fertilizer, only excepting stable manure, which, by making a sure return to the soil of the constituents which have been taken from it, is a never-failing source of fertility wherever applied with judgment.

When I think of the blessings vouchsafed by this wonderful plant—a native of the marble-ribbed soils of the Orient, and sung of as among the pastoral glories of classic Greece and Rome, where it grows still among the rocks from which their grand monuments have been chiseled—I do not wonder that its introduction into Germany, which took place only in the latter part of the last century—won for the introducer of it there (John Christian Schubert), the proud title of "Ritter von Kleefeld," (Knight of the Clover field), which was bestowed upon him by the Emperor Joseph II, as a mark of imperial appreciation, and that not only was Schubert (all honor to his name!) thus rewarded, but that silver dollars were granted as premiums to all who imitated him by growing clover, to be proudly worn around their necks, under the significant popular designation of "clover dollars." Nor do I wonder much that Sercucius, the ancient Roman god of the dunghill, which was the primitive representative of fertilizers, had altars erected to his worship in the various educational institutions of Germany in which agriculture was a branch of study. And we may readily imagine his modern worshippers to have repaired to these shrines with their offerings of new-mown hay, from whose myriad honey-freighted blossoms was exhaled, as a "sweet smelling savor," the well known delicious odor of the clover field, to gladden the senses of their deity; and we may safely conclude that it did this quite as surely as when, according to the description of Virgil in one of the pastoral strains of his Georgics, those more ancient devotees laid at the feet of this same manure god the firstlings of their flocks, or the richest fruits of their fields. I confess that nothing would so much tempt me to become a worshipper at a Pagan shrine as the grateful emotions which I have never failed to experience at the sight of an "Old Virginia" clover field, in full bloom, on some balmy morning in the month of June, or as I hope to ere long see its like again, everywhere, in New Virginia!

At the conclusion of this paper, the thanks of the Club were tendered to the author.

### SURFACE MANURING FOR WHEAT.

Mr. C. R. Baker, Attica, Wyoming county, N. Y.—A little more than a year ago I covered a small piece of winter wheat with coarse horse manure, spreading it as evenly as possible on the top of the snow. At that time there was but little snow on the ground, and, for fear it might all melt or blow off and leave the wheat exposed, I concluded to keep it covered with manure, knowing that a top-dressing would be beneficial to the crop after the frost was out of the ground in the spring. When I came to harvest the wheat, I found it was remarkably plump and heavy, and, after threshing some of it with a flail, I thought I would measure it as accurately as possible, and weigh it to see how much it would go to the bushel, and the result was sixty-three pounds. I cannot say whether it is all to be credited to the manure, or only in part, for the land is a clay loam, and has always been considered rather poor soil, or at least until quite recently. Be that as it may, I took a crop of spring wheat off of the same ground, but a few weeks before I plowed it for the crop which I have mentioned, and that was a good crop; the yield was about eighteen bushels to the acre, plump and nice. For the spring crop I broke up the ground in the fall of 1865, and on the 19th day of April, 1866, sowed my wheat on the inverted sod, and harrowed it twice over; so you see I did not take any extra pains to make a crop. I cannot tell how many bushels there are of the winter wheat, as it is not yet all threshed, but, judging from that which I have threshed, think it will yield about the same as the spring wheat did.

Mr. Henry Atwood, Lancaster, Erie county, N. Y.—I will give my method of raising wheat in a small way, on poor land. Plow the land in June. Drag well, and cultivate with wheel cultivator several times. After the turf begins to ferment or rot, about August 20th, plow again, then dray, then draw out your manure, lay it in heaps twelve feet apart along the center of each land, and be careful not to make your heaps too small; then spread evenly over the ground; sow your wheat as soon after spreading the manure as possible, then put the cultivator on again, dray or harrow, and have it all done by the 1st of September. In this way the manure and earth are mixed near the top of the ground, where it gives vigor to the root, and will, as a general thing, bring a fine growth before winter sets in. I have tried this method for several years on our poorest clay soils, and have never yet failed of getting good wheat. A dairy of twenty or thirty cows is very convenient for treating this kind of land.

### BLUE GRASS.

Mr. E. S. Hulin, Holton, Jackson county, Kansas.—Can I get blue grass to grow on the prairie without first subduing the sod?

Mr. N. C. Meeker.—Yes; but it will take several years. Blue grass follows in the trampings of sheep and cattle. The best way to get blue grass is to sow on wheat or oats a mixture of equal parts of clover, timothy and blue grass. First, the clover will cover the ground and shade the timothy; in two or three years the clover will die out, when the timothy will occupy the ground, after that the blue grass will come and stay forever. But what is the matter with the natural grass of Kansas? We had supposed it equal to timothy, and far better than Illinois prairie grass. Fence in your prairie, and you have a stand of good grass to your hand. It is often the case that people have possessions of great value, but do not know it, and think what somebody else has is just the thing they want, while somebody else is wishing the same about them.

Adjourned.

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## February 11, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### WATER PIPE.

Mr. W. B. Fuller, West Walworth, Wayne county, N. Y.—I wish to inquire what is the cheapest and best kind of pipe for conveying water from a spring to my house and barn, and also, more particularly, in regard to how water-lime cement pipe is made.

Mr. Daniel Burr, Fredrica, Del.—In 1854, I had eighty-nine rods of cement pipe laid in Morris, Otsego county, N. Y., and I consider it the best for conveying water I ever saw. It should be laid deep enough, so as not to be affected by frosts. I put mine three feet under ground, which well repaid me by keeping the water cool in hot weather. In moist ground the pipe was perfect; therefore, the deeper it is laid the better, as it cracks in dry earth. I used half a bushel of water lime, and one bushel of clean, coarse sand per rod in making it.

A correspondent sends the following: To begin, first see if sand of the best kind is to be had. It is said that clean and coarse is best. What I used would average nearly as coarse as pin heads. If such is not convenient I would take finer, make it clean, and mix with an equal quantity or more of gravel, which may vary in size from a pin head to a hickory nut. Get cement that will set at once, else time will be lost in waiting. Next, dig the ditch two and a half or three feet deep, wide enough at the bottom to work in conveniently; grade the bottom with some care. Now, make a wooden rod, the size of the passage desired, eight or nine feet long, perfectly straight, round and smooth, so that if turned in the soft pipe, it will not disturb it a particle. Two inches from one end cut a slight notch all round, not quite one-eighth inch deep. Take a piece of soft leather or rubber eight or ten inches long, fit it around the end of the rod till the edges meet evenly and smoothly; sew it together and tack it fast. Stuff it with dry grass or cotton, making it smooth and plump, the same size as the rod. Just at the end of the rod the stuffing should be a little loose, making a flexible neck that will allow the rod to be raised while putting down the plaster. A few feet of gas pipe of the right size may be bent into shape, by heating the proper places, to raise the water from the bottom of the ditch to where it is to pour out. Otherwise a wooden upright must be procured. This must go down far enough to stand firmly. Two inches above the bottom of the ditch make a hole in the side, and put in round tile, or something around which to begin the cement. Three hands can work to advantage. Have water, cement and sand convenient. One man should measure out two parts of the mixed sand and gravel (some say three) to one of cement; mix it quickly and thoroughly with water sufficient to make a mortar easily worked, and stiff enough to keep its shape when heaped a little. Be sure and not mix more at once than can be put down in one length of rod. Put it in a wheelbarrow and carry it to the ditch. Another man can throw it in, while the third, in the bottom, with a trowel, spreads it evenly, in a straight line, in a bed about two inches deep and four in width. When about half the mixture is used, lay on the rod with the flexible end inserted in the pipe, or till that enters the penstock; press it down slightly, then carefully and smoothly cover the rod, making it two inches or more on all sides; cover slightly with soil, to prevent cracking by drying too fast. A few inches of the end of the rod should be left out. Take hold of this, twisting it slightly, and, at the same time, draw it out, leaving only the leather end in the tube thus made. The upper end of the rod is now laid up one side, and the process repeated. If there are any angles, a short rod will be necessary, and the ditch should be wider at such places. Should it go over a knoll (which should not be higher than the fountain, of course), I am told that at the highest point an opening must be made; having no experience here, I cannot say. When finished, see if it can be blown through, which will be some indication that it will carry water; but do not let any water through till the ditch is filled, and even packed, at the lower end, or any place where there is a pressure to raise the water.

Mr. Wm. S. Carpenter thought that lead pipe half an inch in diameter, could be put down for fifteen dollars per hundred feet, and he did not believe the water would injure any one if it was constantly kept running.

Prof. Nash.—I am afraid the remark of Mr. Carpenter will do damage. His water may not take up lead at all.

Mr. J. C. Thompson.—By a recent invention iron pipes can be used instead of lead.

Dr. William B. Peck.—A tin pipe encased in lead is now being made in this city by the Colwell, Shaw & Willard Mauufacturing Company, which is perfectly harmless, and having the tin lining, is much stronger than the ordinary lead pipe.

Dr. J. E. Snodgrass.—People often swallow bullets and shot, and yet are not injured. I do not believe that any hurt comes from using water that runs from lead pipes, because they soon become coated with a substance that keeps the water from coming in contact with the lead itself.

Prof. Nash.—This question is one of great importance. Carbonate of lead is a deadly poison. I know a family that used water from lead pipe for twenty years, and yet they were perfectly healthy. In this case, however, the pipe for a long distance was on a dead level, so the poison was not forced into the house. In taking this pipe up years afterward, there was enough white lead found in the pipe to paint a small house, inside and out, and if taken internally, would kill a small army. I have known bullets and shot used as physic, but in that case no chemical action of water and lead could take place.

Mr. R. J. Dodge.—While it is so doubtful, we ought not to recommend the use of lead pipe.

### RUTA BAGA TURNIPS.

Mr. R. W. Wasson, Coatsville, Ind.—I own three acres of land about equally divided between clay and loam, and out of not less than seven attempts to raise ruta bagas, in not one have I succeeded.

Mr. P. T. Quinn.—On the ground where we raise early potatoes, we grow a crop of turnips the same year. About the 15th of July we throw the ground into ridges by turning two furrows together, making the rows two feet apart. We plant in drills on the ridges, using two pounds of seed per acre. When the plants are about three inches high, we thin them out, leaving the turnips from four to six inches apart. Ruta bagas will yield from two hundred and fifty to eight hundred bushels an acre.

### FLAX IN CANADA.

Dr. M. W. Brown, Paris, Ontario, Dominion Canada.—For a few years past there has been no little solicitation on the part of men who had or were about to establish flax mills, to induce farmers to sow flax, by lending seed to be returned in the fall, and agreeing to purchase their crop, rotted or not, or dressing their crop on shares, or purchasing their half when dressed, at a given price, which was generally four or five cents below the market price. The mill men took half for dressing—rather a heavy interest; but the farmers had no alternative for want of concert of action. The only way for farmers to make flax-growing profitable is to club together and buy a brake and scutching machine, and run it by horse-power when water-power is not convenient. The brakes first used here were from Todd & Rafferty, Patterson, N. J.; cost, about $400—about the price of a threshing machine. The average yield of flax-lint per acre is sixty to two hundred pounds; seed, ten to fifteen bushels. Price per pound here, before the termination of the reciprocity treaty, fifteen to seventeen cents per pound; now, about ten cents. Flax delights in clay loam or strong soil; wherever hemp does well, flax should be grown to profit, as on western bottom lands. Canada exported last year three hundred and ten tons and fourteen hundred weight of flax, amounting to $72,144, all of which went to the "States," except $568, which was exported to Great Britain. We cannot see how the American duty on our flax is of any particular benefit to the Canadian grower, but it may be to the Americans in point of revenue. Canada to-day is burning her candle at both ends, paying a duty on imports and exports, and if there is any one thing the American people have reason to be proud of, it is their protection to home industry. Wool comes free into Canada; cotton, woolen and linen goods, duty so low that the manufacturer here must buy the home product low to compete with foreign importation. It may linger along, but we never can attain that measure of prosperity which our facilities invite, without some change in our programme. Whether we shall ever raise a Henry Clay is yet to be seen. We have more water-power running to waste than the combined steam-power of Great Britain, but no one comes in to occupy it; capital goes where the united voice of a people insures its success. We imported last year $1,034,583 in linen goods, and our flax goes begging for a market.

Mr. N. C. Meeker.—We are glad to hear from our Canadian brother. This flax question is one of the utmost importance to the whole civilized world, because the time cannot be distant when it will be utterly impossible to grow cotton enough to furnish clothing for the increased population. Cotton cannot grow where grass will, and such soil is soon exhausted. Flax will grow in a grass country for thousands of centuries, because the grass will keep up the fertility.

### HOW TO RIPEN PEARS.

Mr. Pope, Cherry Creek, N.Y., wanted to know how to ripen pears.

Mr. P. T. Quinn.—Pears should be picked carefully, and put in a cool, dry place, away from the light. When wanted for use, they should be removed to a warm room, to bring up their color and quality.

### SELLING VEGETABLES BY WEIGHT.

Mr. P. T. Quinn offered the following resolution:

*Resolved*, That the Farmers' Club of the American Institute unanimously indorse the bill now before the New Jersey State Legislature, for regulating the sale of vegetables by weight.

### FLY-DESTROYER.

Mr. Prindle, East Bethany, N. Y.—I saved a crop last year from flies by using sifted lime.

Mr. J. C. Thompson.—Flour of bones, used freely, is a sure preventive against bugs and insects.

Dr. Wm. B. Peck.—Will not any kind of impalpable substance do as well? I know a man who puts common street dust on his vines, and has no trouble with insects.

Prof. Nash.—Cresylic soap kills or drives away all kinds of insects.

### TRIMBLE SWEET CORN.

Dr. Halleck said that he had given this corn a thorough trial the past season. He thought it was the best sweet corn he had ever eaten. I shall send the Secretary some for distribution.

### MAKING SOAP.

Dr. Bush, Setzler's Store, Chester county, Pa.—Many persons have trouble, and should know the reason—which is, in most cases, the presence of an acid. The remedy is the use of quicklime to correct the acid. Ashes and lye absorb carbonate acid from the air, and form carbonate of potash, which hinders the production of soap. The use of quicklime decomposes the carbonate of potash; the carbonic acid unites with the lime and sets the potash free. Half a bushel of fresh-burnt lime is enough to mix with a leach of twenty bushels of ashes. Lime can also be added to lye with good effect.

### FEEDING SHEEP FOR MARKET.

Mr. W. Patterson, Brooke county, West Va.—There are a great many sheep fed for market here. They are fattened on grass in the summer; and to keep them in good condition through the winter, you must shelter from the wet and cold, and commence to feed corn gradually, increasing to two bushels per day, or its equivalent of oats, rye or barley, per hundred head, and give them as much hay as they will eat. It is considered difficult to fatten sheep during cold weather. Sheep should be four years old, or over, to fatten easily. Our sales are during the months of February and March. Corn is considered the cheapest and best feed in this region, and is the easiest to raise. One hundred bushels of shelled corn per acre are often produced. It should be shelled, and fed in troughs twice per day, one bushel per feed. Sheep kept for stock purposes, and in good living order in the fall, can be well kept through the winter on one-half bushel of grain per day, with good hay or other roughness, with the addition of good shelter and care.

### DISH-WASHER.

Mr. S. D. Sykes, Buffalo, N. Y., exhibited one of these machines. It is a light box, lined with zinc, in which revolves a fan inclosed with a wire grating, on which the dishes are placed. Hot water is poured in, and the fan throws the water among the dishes with great force.

Dr. Wm. B. Peck spoke of the impossibility of getting dishes cleaned in some families, on account of the drudgery of the work; then, that having used one of these machines in his house, the dishes come on the table perfectly clean. In saving labor, and in doing it well, it has few equals.

Mr. N. C. Meeker.—Having one in my house, I notice that the girls use it altogether, and that they wash the dishes in less than five minutes, and a large number is washed just as soon as a small one. It seems to me that in families where a girl is hired as much to wash dishes as anything else, that this machine would take her place.

### LONG'S WASHING MACHINE.

The committee appointed to report on this article, state that five shirts were washed well in five minutes.

Prof. Nash.—We, who are called the lords of creation, do not value household labor-saving implements. On a farm, hundreds and thousands of dollars are invested in farm machinery, and scarcely anything for the household. We ought to consider more than we do, how many steps women take, and how unremitting are her labors.

### CAMPHOR BAROMETERS.

Prof. Tillman directed attention to the fact that what has been published about camphor barometers is in no way reliable. He said numerous experiments have been made with a view of testing their value; and the result is entirely satisfactory that such instruments are of no practical value.

Mr. Wm. S. Carpenter.—I have such a barometer, and it is utterly worthless.

### CROSS BETWEEN COTSWOLDS AND MERINOES.

Mr. S. Brigham, Bethel, Vt., inquired by letter whether a cross between a Cotswold ram and Merino ewe would not produce a race of sheep possessing in the same animals both excellent mutton and wool qualities.

Mr. S. E. Todd.—Such a cross would produce an excellent mutton sheep, but would not improve the quality of Merino wool.

Mr. N. C. Meeker.—I don't see what can be the use of such a cross, when the Cotswold sheep are already considered about the best mutton sheep there is. And as to the wool, some say it is better than Merino fleeces.

### MANAGEMENT OF WHEAT FIELDS.

Mr. J. P. Gratting, Shortsville, N. Y., wrote that he has a field of wheat of twenty-six acres of dark colored soil, which is quite lumpy. Shall I, or not, roll the wheat in the spring? When is the better time to sow clover seed on that field?

Mr. S. Edwards Todd.—I will give a brief response to those inquiries. I have never failed to raise a satisfactory crop of red clover, whether the seed was sown in spring or autumn, in summer or winter, provided the soil was all right. Red clover (*trifolium pratense*) is a leguminous plant. When the seed germinates, it is taken on the end of the stem, and thrust up out of the ground like the germination and growth of a bean. When red clover seed is sowed in autumn, the precaution must be taken to sow the seed so early in the season that the young plant may get a firm hold in the soil, otherwise the seed may as well be cast in the mill-pond. The best crop of red clover that I ever saw was near Auburn, N. Y., where the seed was sowed in early autumn. There are several important circumstances to be taken into consideration when clover seed is to be sowed. If the soil is very heavy, there is some danger that the seed may be buried too deep. If the weather should be very wet in the spring, and then should be very dry—so dry that a hard crust were formed on the surface of the ground—the crop might be endangered by burying too deep. But, if the soil be in an excellent state of fertility, there is little danger of sowing too early. There is so much oil in clover seed that it will remain all winter in the ground without injuring the germ of the kernels. Where the soil is a light black loam, similar to the land alluded to by the inquirer, the earlier the seed is put in the better it will be, as the seed is more likely to be burned in the soil, when the frost heaves the surface like a honeycomb. As to rolling rough ground when wheat is growing, it is better to defer that process till after the cold weather has passed. I'll tell you why. The roller is apt to displace many of the roots of the young wheat plants. Therefore, if the rolling be done before the freezing weather has passed, much injury may result from rolling the ground too early. It is an excellent practice to roll rough land in the spring, where wheat is growing, as a smooth surface is thus prepared for the harvesters. Clover seed is sometimes sowed in fields of growing Indian corn in August, after the last hoeing. Those who practice this are sure of a satisfactory crop if the soil is in a fair state of fertility. Red clover seed may be sowed at any time in winter, or even in May, if the soil be only in a condition to secure germination and rapid growth. Adjourned.

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## February 18, 1868.

MR. NATHAN C. ELY in the chair; MR. JOHN W. CHAMBERS, Secretary.

### PRESERVATION OF FRUIT.

Prof. Nyce, of Cleveland, Ohio, exhibited grapes and pears perfectly preserved, and eggs eleven months old as fresh and delicately flavored as though laid yesterday. He explained his theory of egg-preserving, and held that we must regard the egg as a living creature, and that it must have air in order to preserve its proper healthful smell and taste. In the tight houses in which these preservations are carried on, he has chloride of sodium as an absorbent of moisture, and uses charcoal in order to keep the air dry and to absorb the egg smell. He says no process now known, except his, will keep an egg sweet, fresh and well-flavored. They will taste of the substances with which they have been surrounded. He thinks eggs may be so perfectly preserved by his art, as to sell in January at a small advance on the May price.

### STUMP MACHINE.

Mr. George Pressy, Hammonton, N. J., showed a combination of remarkable power for lifting great weights and pulling stumps. Two men can lift twenty-five thousand pounds with it, and draw a green oak stump, a foot in diameter, every ten minutes. In a field they can take out a hundred stumps a day, and by active work, a hundred and sixty. It sells for sixty dollars. Messrs. N. C. Meeker, S. E. Todd, J. B. Lyman, J. B. Peck, and, *ex officio*, the Chair, were designated as a committee to visit South Jersey and witness the performance of this machine operating "among the stumps."

### HAND-GLASS FOR PROTECTING PLANTS.

Mr. St. John, of Stamford, Conn., showed an improved folding hand-glass for protecting plants from spring frosts. It consists of a light frame of japanned tin with grooves, into which a pane of glass is slipped. The frame, without the glass, is for sale at most of the seed and implement stores, at thirty cents. When folded, it occupies no more room than a slate. There are various sizes, to suit plants in different stages of advancement. When open, it looks like a tent, and the ends are of common domestic.

### PULVERIZER.

Mr. John Custer, of Corsica, Ohio, showed the model of a new pulverizer to cut and crush turf and clods of earth.

### TENNESSEE.

Rev. H. Bokum, Commissioner of Emigration, from Tennessée, was introduced, and gave the Club a brief account of the charming climate, good soil and cheap lands of that State. He is the commissioner for immigration for that State, and represents it as more attractive than any other State in the South. He has prepared a handbook of information on the subject in English, and also in German. Those who wish information on this subject, should apply to John Eaton, Jr., Nashville.

### HEN MANURE.

Mr. J. C. Thompson, Tompkinsville, Staten Island.—The better way to prepare hen manure for use is, to spread dry earth in the hennery, which will absorb the ammonia of the droppings. Dry earth should be spread every day under the roosts of the fowls. In the spring remove the accumulations from the hennery, and put them in a heap where they can be shoveled over and over a few times, and reduced to a fine powder by running the mass through a coarse sieve. The powder is then applied to corn or potatoes, at the rate of about one quart per hill.

Another member spoke of running the compost through a threshing machine, for the purpose of reducing the flakes and lumps to fine powder. Some spoke of casting wood ashes and coal ashes into the hennery; but the practice was denounced as destructive to good manure, because the alkali, they said, would liberate the ammonia, instead of retaining it. Mr. Thompson affirmed that wood ashes will most assuredly give fowls sore eyes, if they be spread in the hennery.

Mr. Wm. S. Carpenter.—When gypsum can be had, the best way is to mix the manure with it. Land plaster or gypsum is, of itself, a powerful fertilizer. It increased my potato crop twenty-five per cent.

### POTATOES.

Mr. E. Williams, Montclair, N. J., read the following paper on the varieties of the potato, and some hints on potato culture.

The frequent and repeated failure of the potato crop from disease, for the past few years, has induced many cultivators to pay more attention to this valuable esculent then formerly. This is apparent from the number of new seedlings, and the re-naming of old ones that frequently make their appearance, the various theories and speculations as to the cause of disease, the remedies therefor, the invaluable secrets and patent processes by which, for a consideration of one thousand dollars, more or less, the grower can obtain the knowledge of a remedy that will prove infallible. These, with the frequent calls for information in regard to varieties and methods of potato growing, has induced me to write out in a very brief and desultory manner, the method I have adopted and practiced for the past few years, the results of which have been quite satisfactory.

I shall not indulge in theories and speculations as to the cause and cure of disease, but may state a few facts and observations that led me to adopt the methods I shall detail to you, and which I call "my experience in potato growing."

I lay no claim to its being the best in practice; neither do I set myself up as a teacher presuming to know it all.

I am ever ready to learn of others, and hope they will give us their experience, that we may all be benefited, and thus contribute to the fund of the best general in the land—"General Information."

My practical experience with potatoes is confined within the past ten years. During this time I have experimented considerably with varieties and modes of culture, the results of which I have hastily embodied in the following brief paper.

1. *The seed and its preparation.*—If you were to see a farmer save his corn nubbins for seed, or select the meanest and most indifferent specimens of horse, cow or swine, from which to perpetuate his stock, you would doubtless at once set him down as a fool. Let us hope this practice is not prevalent; yet many otherwise intelligent farmers act about as sensible in their potato growing, for they insist year after year in selecting small seed, and then won-

der they don't succeed better; "potatoes don't do as well as they used to! shall have to buy potatoes this season!" &c.

Now, reasoning from analogy, "like begets alike," and for the same reason that I would select the best ears of corn, the best and heavist wheat, rye or oats for sowing, would I select the best, largest and smoothest potato for planting, believing as I do that such potatoes are earlier, maturer and better developed than small ones.

True, such seed would bring a little more than small ones in the market, but a few dollars and cents gain there is no comparison to the gain I believe I get in the increased yield, continued health and vigor of the future crop.

I believe one chief cause of the failure and deterioration of the potato is the persistent use of small and immature seed. My experiments have led me to practice cutting seed to one or two eyes, to prevent overstocking, and to allow the growing tubers room to "spread themselves."

2. *The Soil.*—I generally follow corn with potatoes. If the corn was well manured with stable manure, and the sod well decomposed, I plant the potatoes in drills or rows about thirty inches apart, and ten to twelve inches apart in the rows, with only a slight dressing of lime, ashes, or plaster applied on the seed after dropping. If the soil is poor, I apply ,a good dressing of well decomposed manure broadcast and harrow it in. (Green, unfermented manure is to be avoided, as it tends to engender disease.) In either case I apply the dressing of lime, plaster or ashes in the row before covering, and plant early. If the ground is very foul I plant in hills two and a half to three feet apart, and cultivate both ways. As soon as the young plants begin to peep through, I hitch to the harrow and cross the rows. This is the first cultivation. In about a week or ten days I run a plow through, turning the furrow from the rows, and hand hoe, taking particular pains to loosen the earth around the plant, which by this time is apt to be somewhat baked. For this purpose, or hoeing of any kind, I have never seen an instrument that will compare with an unpatented pronged hoe which I have had made to order. The next plowing is done just before blooming, the furrow turned towards the row, hand hoed and hilled moderately. No further attention is given them till harvesting, unless it be to go over and pull out any weeds that may have escaped our attention at the last working.

3. *Harvesting.*—If attacked with rot, which is readily seen by the blight of the leaf, the sooner the potatoes are out of the ground

the better. Some people prefer letting them rot all they will before digging, but my experience is, that but little rot occurs after digging, if dug before the disease is communicated to the tubers through the stalks. Pulling the vines as soon as the disease manifests itself might answer the purpose, and obviate the necessity of digging till a later period. In digging I run a Mapes' subsoil plow under the row, which lifts them up and loosens the ground, so that the labor of following with pronged hoes is comparatively easy. As soon as dry they are gathered up and put under cover, in a dry, cool place, in the barn generally, if the weather is warm, and on the approach of cool weather removed to the cellar. In either case they are kept closely covered, as exposure to the light for a few days injures the quality very materially.

4. *Varieties.*—In my boyhood the Scotch Grays or Blue Noses, as we used to call them, and the Pinkeye were the standard sorts, till the advent of the Rohan and Merino, which were going to supersede everything, but like many other things of more recent date, they soon "played out." After these came the good old Mercer, which gained such a hold in public favor that it was with the greatest reluctance people gave it up, notwithstanding it failed for a time to yield remunerating crops.

At the date of this experience, ten long years ago, it was almost the only sort grown in my locality, but its uncertain yield and tendency to disease induced people to look about for a suitable substitute.

The Prince Albert and Fluke were tried, and promised well for a time, but soon began to deteriorate. The Red Peach Blow also became so diseased as to be worthless for general use.

About this time, the labors of Rev. Chauncey E. Goodrich, in this direction, attracted my attention; and, in 1862, I procured of him four of his then best varieties, viz: Garnet Chili, Coppermine, Rusty Coat and Cuzco.

A thorough trial and careful experiments with these, convinced me he was on the road of progress and improvement. With these varieties we have plenty of potatoes to use and sell, while under the old dispensation it required a large patch to yield a family supply. Although not quite as fine and delicate in quality as the Mercer, to which we had become so much attached, we were willing to accept an abundance of a good article in lieu of a scanty and uncertain supply of a superior one. Their introduction at the time of the universal decline of the Mercer, attracted public attention to such an extent that an offer to send them by mail, under the provisions of the postal law just passed by Congress (which, by the way, I consider one of the most wise, sensible and beneficial to the people of any act that ever emanated from the councils of that august body), resulted in the spring of 1865 in my sending about two hundred packages, of four pounds each, by mail, from Maine to Kansas. The yield from these four pound packages, as reported to me, varied from three to eight bushels. Of these four varieties, I regarded the Coppermine as the best in quality, and its smoothness added to its popularity. In some localities it has done even better than with me, and proved an acceptable substitute for the Mercer by those who grew the potato largely for market. The Chili was somewhat tender, and being of a red color and variable in quality, failed to achieve the position it would, had it a white skin.

In point of hardiness, the Rusty Coat exceeds them all. It will grow on the strongest soil, and endure green, unfermented manure with impunity. In fact, it requires strong soil to develop a crop of good sized tubers. Although not as fine grained or white in flesh as desirable, it is an admirable keeper and excellent for spring use. The *Cuzco* was the most productive and the poorest in quality, though some seasons it was very fair, especially when mashed, as it was rich in gluten; but its numerous deep eyes were very much against it.

In point of health, all these varieties were a great advance over the Mercer, the Coppermine being the tenderest. The prejudice entertained by some people against new varieties of anything as well as "book farming," is stubborn and deep-seated, and ofttimes is a serious obstacle to the introduction of things of real merit. "Facts," also, are "stubborn things," and in the contest prejudice is gradually yielding.

As an illustration, I cite the following: A neighbor, who joined me in testing the new varieties, planted his Coppermines a little thinner towards the close, in order to save a couple of tubers to give to his nephew. On presenting them they were refused. He had finished planting—had no room for them. The Mercer was good enough for him. You could not sell them after raising them, &c. He was finally prevailed on to accept and plant them. In the autumn he harvested half a bushel, and was rather pleased with the potatoes and the experiment, so that in 1863 he planted the whole, and harvested twenty-two bushels. In 1864 he planted the whole of those, to the exclusion of the Mercer, and even refused me a few for my own planting, as I was a little short of seed that spring. No; he was not going to plant anything else; they were as good as the Mercer, and sold as well. That season he sold over one hundred bushels out of the field as dug, for two dollars per bushel, besides a large quantity he stored for winter sales. That same man is now not only ready to accept, but pay liberally for any new variety that promises to be an acquisition.

I remember writing to Mr. Goodrich, detailing the result of my experiments with the varieties, and suggesting the need of a variety earlier than any of these, with the productiveness of the Cuzco, the smoothness and quality of the Coppermines, and the hardiness of the Rusty Coat. His reply was just such as I should expect from one who had taken so much interest in the matter, full of faith and promise and gratification that his efforts were beginning to be appreciated, and expressing a hope that the next season would be able to fill the needed want; but, alas! the open grave lay between him and the realization of his fondest hopes, and he died a poor man, whose years of labor, toil, anxiety and experiment are a rich legacy to us, his survivors. Of him it may well be said, he deserved a nation's gratitude. The next season, 1865, his executor, Mr. Heffron, sent me his early Goodrich, Gleason and Calico. Three years' trial of these, with as variable and unfavorable seasons as usually fall to our lot, enables me to fix their relative positions with some degree of accuracy. The Calico is very handsome, with few eyes, only medium in quality, tender and unproductive.

The Gleason resembles its parent, the Rusty Coat, in size, color and habit; appears to be a little more productive and better in quality, late, perfectly healthy; an admirable late variety, and, like the Rusty Coat, keeps till midsummer. The Early Goodrich thus far would seem to realize the fondest hopes of its originator. It is white in skin and flesh, two very important requisites. It is smooth, large, early, productive and healthy. Finally, its quality is unexceptional.

True, we have better quality potatoes, of which the White Peach Blow is my standard of excellence, but it is late, deep-eyed and tender, liable to disease — three demerits the Early Goodrich has not.

With the Early Goodrich we have no further need of White Sprout, Dykeman, Buckeye and similar ones for early use, and with Harison, Gleason, Rusty Coat and White Peach Blow for late table use, and Cuzco for feeding purposes, we can well dispense with the Chili, Monitor, Prince Albert, Calico and a host of others of like character. Our list of potatoes, like our fruit list, is unnecessarily long, and with perhaps the exception of a few localities, and varieties especially adapted to them, the wants of the masses can be fully met in the Goodrich Seedling and the White Peach Blow, until an improvement is made thereon. I do not wish to be understood as claiming that perfection has been reached, but I do say Mr. Goodrich's labors and success are far in advance of any other, and to him the people of this country owe a debt of gratitude they never can cancel.

In conclusion, it may be a matter of surprise to some that I have commended so few varieties. That there are others of merit I admit. Localities and soils are as varied as people's tastes, and all effect to a greater or less extent, the estimation in which a variety is held. I do not expect all tastes to agree with mine. I have merely stated what I consider the best, and commended those that I have been most successful with, believing others, with the same varieties and practice, will attain like satisfactory results.

If, in this brief paper, I have given any hints or suggestions that will untimately tend to benefit any of your readers, I shall feel amply repaid for its preparation.

At the conclusion of this paper the thanks of the Club were tendered to the author.

### EXPERIMENTS WITH POTATOES.

Mr. J. K. Johnson, Watertown, N. Y.—Last spring I bought a peck each of early Goodrich, Gleason and Harison potatoes, costing four dollars and seventy-five cents—rather dear; planted them on thirty rods of good soil; season very dry and unfavorable; yield, early Goodrich, five rows, twelve bushels; Gleason, ten bushels to three rows; Harison, four rows, sixteen bushels. Early Goodrich having more eyes afforded more seed. Two rows Buckeye, planted by the side of the Harison—two rows yield four bushels; two rows Garnet Chili next, yield five bushels. The rows were exactly of a length. Average yield per row, first three sorts, 3.16 bushels; average, last two rows, 2.25 bushels per row. My yield per acre was not very large as you will perceive. I needed light. I think I got well paid for my investment in extra yield, to say nothing of price, although, if I would sell I could get twice or three times the price of common potatoes for all I have. I have none to spare.

### SPECIAL MANURES.

Mr. A. M. Knapp, Poultney, Vt.—I am a market gardener and keep a sharp eye as to what is said regarding manures. I see that some members of the Club discourage the use of concentrated manures.

Mr. A. S. Fuller.—I experimented for twenty years and have bought tons of these manures, and I would not pay the freight on all the special manure a man would give me for nothing, excepting pure bone dust and guano. I had specimen bags sent to me of poudrette, and then got more from the agents, and it was no nearer like the first than charcoal is like cheese. If I wanted manure I would rather have it sent in barrels from the stables in this city than the other for nothing. I once took seven kinds of these manures and applied them the same day on the same piece of ground and could see no more difference in the crop where I used them than where I did not. I don't restrict the experiments to one year. I have tried it for twenty and find the same results. I have seen bone dust made of vegetable ivory, which is of no benefit.

Mr. Williams thought all these mistakes arose from not applying the manures in the right season of the year. We must have full experiments by scientific men.

Mr. Cavanach.—There is no such thing as applying barnyard manure out of season.

Mr. Wm. Lawton said he had used a concentrated manure with good results, but, in answer to inquiry, said he had not made comparisons.

Mr. Aaron Stone, Long Island.—Our experiments have been about the same as Mr. Fuller's, and we have been most outrageously swindled. We rely principally on stable manure.

Mr. Cavanach.—I once went to a guano establishment on business, and seeing a gate open I entered a yard, where I saw two sloop loads of Long Island sand being unloaded, and men engaged mixing it with the guano.

Mr. P. T. Quinn.—I am a great advocate of stable manure, but I also use great quantities of superphosphate. I am not aware that any one person in this State or New Jersey uses as much as I do. I have found great benefit from its use. If I can raise six hundred dollars worth of vegetables from an acre, at an expense of two hundred dollars for artificial manures, I shall continue to use them.

## CUMBERLAND TABLE LANDS.

Mr. W. W. Powell, Crossville, Cumberland county, Tenn.—In Mr. Lyman's paper on "The Pasture Lands of the South," I notice some errors which I wish to correct. The proceedings of the Farmers' Club are watched with much interest by many thousand readers, and it is desirable that they should be true. Mr. Lyman says "These mountain sides, and high plateaus would produce neither cotton, tobacco, hemp, nor paying crops of Indian corn." In point of fact, cotton will grow on these highlands, and some years it will mature, but cannot be relied upon as a profitable crop. As regards tobacco, I have seen fine crops growing in this county, and am informed by those experienced, from Virginia, Kentucky, and North Carolina, that these table lands are in no way inferior, while our white oak, and hickory lands, of which we have a large amount, produce an article of superior flavor. It is not uncommon to have these timbered lands produce forty or more bushels of corn per acre, even after several years' continuous cultivation without manure, and with our wretched system of bull-tongue scratching. It is a mistake to suppose these table lands incapable of profitable corn culture. The same skill and labor bestowed upon the corn crop at the North, would make it a profitable crop here. Mr. Lyman mistakes in calling our soil a gravelly loam—it is properly a sandy loam, and it lies over a yellow clay loam subsoil, though the glades are as he describes. As rich soil as I have ever seen is upon the eastern and western slopes of the Cumberland table lands, and upon the sides and top of Walden's Ridge and Black and Crab Orchard Mountains. These last named rise about 1,000 feet above the table lands proper, and furnish the best localities for fruit culture this side of the Rocky Mountains, if not the best even in the United States; and on these same localities the timber is unsurpassed for beauty. The allusion to dogs and wolves is not appropriate, for scarcely a sheep has been killed by either for years. Of wolves, I do not think there is one in the country. I believe that more than three-fourths of the sheep are never fed, and they obtain their own living from the range and old fields. Wheat will be a success on the table after red clover, and there is not the least difficulty, with the aid of plaster, in making that a success. Our wheat weighs from sixty-six pounds to sixty-eight pounds per bushel, and our clover, when once set in the soil, is perennial. I am convinced it is no difficult matter to raise red clover so large that it will be troublesome to cure. Mr. Lyman says further: "South of the Ohio, it has as yet been found impracticable to attempt winter fruit." In this county we have winter apples unsurpassed in flavor or as long keepers. So far as concerns this county, Mr. Lyman falls into a mistake in saying that "thousands of acres can be bought for twenty-five cents." I should not wish to risk money at that price on account of the title. With these exceptions Mr. Lyman's statements are fair and just toward these table lands; and for myself, and in behalf of the citizens of this county, I wish to express thanks.

Mr. George H. Day, Brooklyn, L. I., formerly surveyor of Cumberland county, says the timber is white, post and chestnut oak, with some hickory and chestnut, scattering black and Spanish oaks. The size of the timber is medium. He has seen good clover and timothy growing. All the root crops do well. He has raised 300 bushels of potatoes on an acre with manure. Sweet potatoes do well. On manured old lands wheat gives from twelve to fifteen bushels per acre, and corn does well on white oak lands. He thinks cattle and sheep can be raised very easily and with profit.

Mr. Frederick Boyes, 27 Wall street, also complains that Mr. Lyman, in his paper spoke of black oak as the natural growth. He says this is true of the ridge, but down on the hill sides the growth is poplar, beech, black walnut, &c. He complains also that Mr. Lyman understated the productiveness of the soil when planted in wheat and clover, and also the price of the land.

It was agreed that all this apparent discrepancy may be explained as Mr. Boyes refers to a small section of country near Crossville, while the description of Mr. Lyman refers to the whole plateau for sixty miles south and west of Cumberland county.

Mr. E. M. Morrison, now of Hamilton county, Indiana, writes that Mr. Lyman's remark "South of the Ohio it has as yet been found impracticable to attempt winter fruit," needs some qualification. He says he has eaten good native winter apples in Mississippi. He thinks "Stevenson's Seedling," produced near Holly Springs, will ripen late and keep well into winter. He says it is true that winter fruit has been very little cultivated at the South.

### MACHINES FOR MAKING ICE.

Mr. E. H. Thomas, Chinese Camp, California, inquired if the Club could tell him anything of the process of making ice in warm weather?

Dr. Preterre stated that in France machines are employed for making ice, in bottles for immediate use. The expense is usually about two cents per pound. The ice is formed by the evaporation of ammonia. He was not aware that this process had been introduced to any extent in this country.

The Secretary.—I understand that Prof. Vanderweyde, of this city, has an invention for making ice, by artificial means, which will be soon introduced to the public. Adjourned.

## February 25, 1868.

Mr. **Nathan C. Ely** in the chair; Mr. **John W. Chambers**, Secretary.

### OSIER WILLOW.

Mr. Smallwood, Warsaw, N. Y.—The ground on which I cultivated willow is a black loam, underdrained and well plowed. The cuttings should be about eight inches long, planted in rows, thirty inches apart in the rows. Cultivate two years, keeping the ground free from grass and weeds, until they become strong enough to cover the ground. They must be cut every year, and the fourth crop with a full one. As soon as the snow disappears cut and tie the willow canes in bundles, and set them in water three or four inches deep. When the buds start they will peel, and we use a machine for this purpose. Good willows yield about two tons per acre, worth ten cents a pound.

### LANDS IN FLORIDA.

Mr. J. H. Sanborn, Fernandina, Fla.—From the thousands of letters which I receive, I am convinced that many people are prevented from coming hither through their inability to buy the good land, while scores who do come, return North discouraged with the poor lands of this State. I have made arrangements with the Florida Railroad Company to give away one-half of their lands, some four hundred thousand acres, so that the poor and disheartened may have pleasant homes and good farms. This offer is extended only to actual settlers. These lands lie along the railroad, and may be selected by the settler himself, anywhere between the Atlantic Ocean and the Gulf or Mexico. I believe this is the only railroad company in the whole world that gives away its lands. This will of itself bring a large stream of emigration, but add to it our magnificent climate, and no other portion of our country can offer equal inducements. The western half of these lands has a rich sugar soil, equal to any in the world, yielding crops for several years without replanting, and is excellent for oranges and grapes. These lands are thrown open for the benefit of those thousands of families in the crowded North whose limited means have hitherto kept them from seeking a home in this inviting clime.

Prof. Nash.—The climate of Florida is delightful, and adapted to pleasure and ease, but the energy of the people going thither will not be sustained twenty-four months. If I had as many sons as Jacob, I would not advise one of them to go. I do not want my own or my neighbors' posterity to degenerate. I believe that God has done all things well, and that each race will be drawn to its proper climate.

Dr. Hallock.—I venture to predict that, if natural laws are permitted to take their course, these Gulf States will be in the possession of a people naturally belonging to that climate, but they must be let alone, while the white races naturally will remove to the climate which is most fitted to their constitution.

Mr. Richardson, late of Texas, said that a man naturally industrious in Maine would work well in Florida, and a lazy man going from the North will be lazy still. The Germans in Texas are noted for their industry and thrift, and the latitude is the same as Florida. It is a man's temper, not the climate, which makes him adverse to labor.

Mr. J. B. Lyman.—I am unwilling that an opinion such as this, having so slender a foundation in fact, should go out to the world as the deliberate expression of this Club. Twelve years' residence in that part of the Union has failed to convince me that Anglo-Saxons are not as vigorous, as large, as brave, and as enterprising in a climate that permits the fig and the orange, as they are where the ground is frozen two feet deep half the year. It is no more of a hardship to work there in winter than it is to work here in summer, and the winter is the proper time there for the heavy work of agriculture. If less labor will yield a livelihood in that climate than in Maine, is there not, for that reason, more time allotted to social enjoyment and mental culture? Florida is not much warmer than Palestine and Greece and Italy, climes from which the most famous and imperishable systems of religion and law and immortal labors of genius have emanated. I have found habits of study and constant industry as easy there as here in New York; and men in daily life seem to me to show as many signs of mental vigor there as in this hyperborean region.

Mr. N. C. Meeker.—Mr. Chairman, this is an important subject. It is a good thing to tell what one knows—not what he guesses. My friend Lyman practiced law in New Orleans. I do not understand that he engaged in plantation labor. I have lived in that semi-tropical climate. I have raised cotton, planted, plowed, hoed and picked it. I was my own overseer, and I do know that the energies of a white man were not sustained there as in the North. It is impossible, during a series of years, while one is subjected to the heat of the sun, the malarious influences, and the attack of insects, to engage in day labor and keep up a supply of health and intellectual vigor. But we are referred to Greece, Italy and Palestine, and their imperishable systems of religion and law. Our friend forgets that men of culture did not labor in those countries, and that slavery was established early, and continued for thousands of years. Whenever white men have been the laborers in a warm climate, they have either been enslaved, or have sunk to the lowest depths of degradation, and they have nowhere exhibited intellectual supremacy. As regards the Germans in Texas, we should understand that the country where they are located is so elevated as to bring them into a higher latitude.

Mr. Thomas Cavanach read the following paper on

## THE CULTIVATION OF RASPBERRIES.

*Description.*—The raspberry derives its name from the Italian word "raspo," in allusion to the small prickles with which the stems are thickly covered. The roots are creeping, and of a woody character. The stems are erect, and attain the height of five or six feet. It is a perennial, although the fruit-stems are only biennial. It is a native of various temperate climates, growing in wild luxuriance by the roadside, through the forests and on the mountains, and the only excuse many a truant from school has had to offer his teacher was, that he was tempted to loiter by the way to pick wild raspberries. The ripening of the raspberry follows close upon the latter part of the strawberry season. When we are tired of the various flavors of this fruit, and long for a change, we look forward, with pleasure, to the coming of the delicious raspberry. Although it does not, generally speaking, command a higher price in the market than the strawberry, yet some think it the cheaper fruit of the two, on account of its having no hulls; yet, from its peculiar hollow shape, the berries will shrink, and thus be reduced in bulk, if they have to be sent any distance to market. If we were going into the small fruit business, our principal crop, next to the strawberry, would be this fruit, for there is no plant that will yield larger returns, with less care, than the raspberry. If we look back a period of twenty years, we cannot fail to notice the difference our markets present in the fruit season. Then a great part of our supply of raspberries and blackberries came from the woods. Even of these the supply was limited, and not equal to the demand; yet we had to be contented with a small quantity of very inferior fruit—that is, inferior compared to what we see in market at the present day. We are not of those who pretend to think they have never eaten as fine fruit of the cultivated varieties as they have of the wild ones. Thank providence, this class of people are fast dying off, or they are cultivating their tastes so as to prefer a luscious Brinckle orange to those they gathered in their youthful days by the roadside. They seem to forget that the all-wise Creator, who has given us the delightful gifts, has also bestowed on man the power and intellect to multiply and improve the fruits of the earth. Within the past few years, the cultivation of the raspberry has increased so rapidly that the demand for plants of the new and improved varieties is so great that the skill of the horticulturist is taxed to its utmost to supply the demand for what was a few years ago a luxury, but which is now considered a necessary, even by the poorest. According to Prof. Grey, there are six species of the raspberry and eleven of the bramble family. This includes the blackberry. Of the first six, there are only two varieties cultivated. These are the *rubus occidentalis*, or black raspberry, of which the Doolittle is an improved variety, and the *rubus strigosus*, or wild red raspberry, which is found growing wild all over the country. This variety, in its botanical character, resembles the *rubus ideaus* of Europe, and from which most of our really good varieties have been raised. The other four varieties have thus far been unworthy of cultivation, yet the day may not be far distant when some of our smart horticulturists may astonish us with a seedling from these superior to any we have yet, and thereby benefit the country, and meet his reward in a pecuniary point of view. The Blackcap has, within the past few years, become exceedingly popular, chiefly on account of its earliness and productiveness. Its season is short, varying from ten to fifteen days with us; yet on the dry and sandy soils of New Jersey we have seen it continue in bearing much longer. We are rather skeptical as to the Doolittle being the result of a peculiar system of propagation, by raising young plants from only the tips of young plants, and not from the old stools. We have tried the experiment for a number of years, and have, thus far, failed to notice any marked difference. We are inclined to think the whole secret has been good cultivation.

*Soil and cultivation.*—Different varieties require different soils. Those varieties which have been raised from the *rubus ideaus* require a rich loam or light clay, always provided that it is of sufficient depth and well drained. The Blackcap does well on light sandy soils, yet does better in a sandy loam; they also succeed well on slaty soils. In manuring for the raspberry, a soil rich in vegetable matter will need only a slight dressing of ashes or superphosphates. If a clay soil, a liberal dressing of barnyard manure, lime and salt, in limited quantities, on such soil will be found beneficial. It will pay to manure, besides the fruit will have more flavor when grown in good soil. In nine cases out of ten the so-called failure of a variety results from the want of proper fertilizers.

*Planting and field culture.*—After the soil has been thoroughly prepared by manuring, subsoiling, and harrowing down fine, the ground may be marked off with a plough in rows five feet one way and four another, similar to planting corn; for the Doolittle, if we were not limited to space, we would prefer six feet. It is in good ground a vigorous grower; and having a few thorns, it is apt to make itself felt. The planting should be done as early in spring as practicable, as the buds of the canes push forth quite early, and, being tender, are apt to be broken; besides, if planted early, the canes will get a good start, and be better able to withstand summer droughts. We prefer spring to fall. If planted in the fall, they will need protection during the winter, or they will suffer severely, and the chances are that a large percentage of them will be found dead in the spring. A single plant is enough in each hill, and this should be cut back to about a foot above the surface of the ground. If these show signs of fruiting, cut off the flower-buds, as they will produce only a few berries, at the expense of the plant, which needs all its strength to perfect its canes for the following year. After planting, it must not be supposed they will need no further care or attention. Much of the success of a good crop of fruit depends upon keeping the ground clean, and cultivating between the rows; and to insure this, we would recommend planting potatoes, cabbage, or some other low-growing crop, on the vacant ground between the rows, the first year. The second year, when they commence to fruit, it will pay to mulch the ground. This may be done cheaply by using corn-stalks; but, if in a neighborhood where seaweed or salt hay can be obtained, we would prefer it. This may remain on the ground for two years, when it will be time to plow it under. The raspberry, like the strawberry, may be stimulated by liquid manures, and thus prolong their fruitfulness. The second year some support will be necessary; what that will be, depends upon the planter's pocket. As a matter of economy, cedar or oak stakes, five feet long, and pointed at the ends, will do; if dipped in hot coal tar, it will preserve them much longer than if not so treated. If economy is no object, wire trellises are the best, for the canes may be trained so as to get the full benefit of the sun, and ripen quicker. Another plan may be adopted, of making one stake do for two hills, by driving the stake between the hills; half the canes on either side are brought over and tied to the stake. Another very neat way is, to take a stake and bore three holes, about eighteen inches apart, through the center; insert three sticks of different lengths, making it somewhat fan-shaped, narrow at the bottom and wide at the top; to these sticks the canes may be tied. It will be found that the fruitfulness of the plant will be much increased if the canes are trained in a horizontal position. This form of trellis is neat as well as cheap, having this advantage over large wire ones: they are easily removed when the fruiting season is over, and may be stored away until next wanted for use. If they are painted with coal tar, they will last many years. By very close pruning of some varieties, we may dispense with stakes, or any support whatever; still, we are inclined to think it will pay to give support, as, in case of a storm, more fruit will be lost than will pay for the stakes twice over.

*Pruning.*—The raspberry requires less pruning than the blackberry, and it may be performed at any period of the winter or spring, when the canes are not frozen. All the old and decayed wood is first removed, if not previously done during the summer. The canes are then shortened back three or four feet, according to the length of the canes and the strength of their growth. Four canes are usually left to a hill; still, five or six will not be too many for some varieties. When pruning, all superfluous or weak canes should be removed; these may be saved to be planted out, to fill up new plantations, or carted to the compost heap to decompose and be fitted to use as manure at some future time. As the finest and best fruit is in all cases the produce of strong and well ripened wood, it follows, as a matter of course, that the young growing shoots should have every advantage afforded them. This will be effected by removing all the old wood immediately after the fruiting season. This will give the young canes more sun, air and room, and thus enable them to make a stronger growth and produce larger crops of fruit. The careful observer cannot fail to notice that the largest and finest fruit is produced on laterals or side shoots; these are seldom or never produced, if the canes are allowed to remain at their full growth; in this case the tendency of the plant is to produce its fruit on the extreme end of the canes. This fact the skillful gardener takes advantage of, by allowing a few canes to remain at full length, merely cutting off the tops; others are pruned at medium height, while others are cut back quite close, as the lower buds do not break out as soon as the upper ones. It follows, as a matter of course, that the fruit will not come in all at once, but will ripen gradually, and thus prolong the season. The so-called ever-bearing varieties are treated much the same. As a rule, no raspberry will produce two crops of fruit the same season; the second crop of fruit is borne in the fall on the young shoots that have grown up during the summer; these bear fruit the following season, and then die, and their place is supplied by others. The Blackcap variety is pruned precisely the same the blackberry; the laterals are spurred in to four or five inches.

*Winter protection.*—As all the varieties, with a few exceptions, are tender, they will need protection during winter. Various methods are in use for this purpose; such as covering with corn stalks, salt hay or manure; but the most effectual way is to plow a furrow close to the hills, and, bending the canes down into the trench thus made with the plow or a spade, cover them slightly; when well covered, they will stand the most rigorous winter. It is not, generally speaking, the excessive frosts that kill a plant; it is the thawing and freezing they undergo during our sudden changes of climate. When spring advances, and there is no further danger to be apprehended from severe frosts, they may be lifted up by passing a fork under them and gently raising them to the surface; then prune, and tie them to the stake with bast mat; we prefer this for tying, as it is more easily broken than cord, when the stakes and the old canes are removed.

*Propagation.*—Until the past few years, the ordinary method of increasing the stock was by suckers. This is dame nature's method of propagation. The Belle de Fontenay must be an especial favorite of her, for it has proved wonderfully prolific in suckering, if not in fruiting; in fact, so much so that we have had to give up cultivating it for want of room. Most of the raspberries produce spontaneously long underground shoots. These, upon reaching the surface, change their character, and from roots become plants, capable of producing fruit the following season. The increased popularity of this fruit, and the demand for plants being so great, has led our scientific propagators to try other methods, not new ones, it is true, but new so far as the raspberry is concerned. These are by cuttings of the root, layers, cuttings of the ripe wood and by cuttings of the green wood of the summer's growth. The first consists of cutting the ends of the roots, which may be easily done by cutting a circle around the base of the old stool, taking care to keep away about fifteen inches from the hill, so as not to disturb it. The portions that have been cut off may be easily forked up. The young roots are then cut up in pieces, about two inches in length, and planted quite thickly in a deep frame, where they will not be likely to freeze. If no frame is handy, the best plan is to plant them in boxes, well drained; first a layer of soil, two inches deep, then a thick layer of roots, another layer of soil, more roots, and finish up with more soil. The box may then be buried in some warm corner, below the action of the frost. As soon as the ground permits of being worked, take up the roots and plant them out in drills, about eighteen inches apart, and four inches apart in the drill. By layering, the cane is laid down in a shallow trench. A slit is cut on the under side, next to an eye or bud, in an upward direction. It is then covered with soil, and thus remains until rooted. The Blackcap evidently believes in the old saw that "The Lord helps those who help themselves," and, disdaining any help from the gardener, bends over and takes root of itself. Cuttings of the ripe wood are made similar to single eye cuttings of the grape vine. Cuttings of the young shoots, when about four inches in length, may be taken off with what the gardeners term a heel; that is, it is separated from the main stem by a piece of hard wood. This should be cleanly cut, and the cutting immediately planted in sand, where it may have the benefit of bottom heat for a few days. Of course it will be useless for any one to try the last two methods of propagation, without having a propagating house fitted up expressly for the purpose. New varieties are raised from seed. Different kinds of raspberries, when planted in close proximity, will fertilize each other. Of course no evidence of this cross-fertilization will be apparent in either form, size, color or flavor; but if the seed of these berries are sown, the young plants will show the effects of this cross-fertilization by being either better or inferior to their parents. In raising seedlings, this fact must be borne in mind, that if we take a cutting from a plant and induce it to produce roots, we do not change its character. It will be precisely the same as the stock it came from, and frequently inheriting whatever diseases it may be subject to. But when we raise a new variety from seed, it is a new plant, and, although it may show traces of its origin, it rarely is precisely like its parent. The raising of plants from seed is both pleasing and instructive. When the seed is deposited in the ground, and after a time the young germ bursts forth from its prison, and sends up its tiny shoots to the rays of Heaven, we are reminded of the time when our bodies shall be quietly laid in the earth, and our souls, at the call of the great Creator, shall spring up and be matured in eternity. It also teaches us to be patient in adversity, for how vexatious it is, after several years spent in carefully watching and attending to what we fondly hoped might prove something wonderful, to find we have spent our time for no other object than to throw our pet plant on the compost heap. Raspberry seed is generally saved by reducing the fruit to a pulp and mixing it with dry white sand, which absorbs all the moisture. When the sand is dry, the seed may be separated, or it may be sown with the sand. If the seed is sown in the fall, it would be well to cover the bed with some kind of litter. This will protect them, in a slight degree, and prevent heavy rains washing them out. The plants will come up in the spring and fruit the second season. The proportion of plants that will be found worth keeping is not more than three or four per cent of the whole, and it generally takes four or five years to fix the character of a fruit.

*Diseases.*—The raspberry, fortunately for growers, is not subject to many enemies. The raspberry brand or rust is sometimes seen in plantations that have been neglected or not well drained. Poor cultivation, we think, will be found to be the source of many, if not all our troubles in fruit raising. The blackberry borer frequently attacks the young canes. The beetle, which is the parent, lays its eggs on the leaves and tops of the young shoots. The grub when hatched, bores through the soft wood, and on reaching the center, feeds upon the pith, causing the tops of the young canes to die. When this is the case, prune off all infected wood and burn it; there are few insects that will survive this course of treatment. There is another insect which deposits its eggs in the flowers, and a very interesting little grub is hatched about the time the fruit is ripe. Whether it adds to the flavor of the fruit, we are unable to say, as we prefer our raspberries and grubs separate.

*Varieties.*—As the main object of those who cultivate fruit for market, is profit, the great desideratum is to procure hardy varieties that will stand our severe winters without protection. In this we have only partially succeeded, if we except the Blackcaps. The majority of purchasers of fruits in our markets, prefer color and size to quality. It seems a little singular, that the Brinckle orange, or any of the white kinds, will not sell as well as the poorest of the red ones. It may be said that the public do not get enough of those choice fruits, and consequently do not appreciate them, and that it is the duty of the cultivator to persevere in raising them, notwithstanding the expense, in order to cultivate the taste of the people. Our advice to young beginners in the fruit business, is to grow none but those that are hardy, productive, and of good size, and let the public cultivate their tastes at their own expense. By these remarks, we do not wish it to be inferred that we are not in favor of quality, if we can get it combined with productiveness and all the other properties, so much the better for the consumers of fruit. The query of the novice is, what varieties would you recommend me to plant? This is rather a difficult question to answer; some varieties appear to be purely local in their character; a variety will do well in one section, and not in another. When this is the case, we should plant only those which appear to do well in our locality, and try a few of the most approved kinds, until we succeeded in getting one that suited us. During the season we made a few notes of some of the best, out of a collection of over eighty varieties, of a gentleman who has done a great deal for horticulture during the past few years. We hope his days may be long, and when he is called away, that strawberries, raspberries, and small fruits generally, may be his monument.

The Antwerps have always been considered the standard variety for size and flavor. It takes its name from the ancient city of Antwerp. There is no date of its introduction into this country. The fruit is large, conical shape; color, dull red, and of good flavor, not perfectly hardy. There are so many varieties now bearing the name of Antwerp, that the novice is puzzled to know which is the original. The Hudson River Antwerp is a popular market variety, but its origin is not known. This may be the original red Antwerp, and not a seedling as has been supposed. The yellow Antwerp that was so extensively cultivated a few years ago, has been superseded by other and better kinds.

Philadelphia: fruit, medium in size; shape, globular; dark red color; moderately strong canes, and few spines; foliage, large and serrated; suckers from the root; is hardy and wonderfully productive, much more so than the red Antwerp. It seems singular that the merits of this berry, which has been known for thirty years, should not have been discovered sooner. However, it has now become very popular, and deservedly so, as it does remarkably well on the sandy soil of New Jersey.

Clark: this apparently belongs to the Antwerp family; of fine flavor, beautiful color, strong foliage, upright canes, and perfectly hardy. This seems to be one of those freaks of nature which occasionally appear without any apparent cause, in all families of plants. The Antwerp family of raspberries, as a whole, are tender in the latitude of New York, and the Clark, after ten years' trial, has proved exceedingly hardy. We think, taking all things into consideration, its hardiness, productiveness and adaptability to a southern as well as a northern climate, entitles it to a place at the head of this class.

River's Seedling, a European variety, partakes of the character of the Philadelphia; fruit medium to large, shape globular, crimson color; it does not sucker freely, and consequently is rather scarce as yet; when it becomes better known it will prove a dangerous rival to the Philadelphia.

Belle De Palluau: a new foreign variety of good size, in shape an obtuse cone, color a beautiful crimson; strong canes and very productive; tender—on this account not likely to be sought after for market purposes.

Fastolff, a European variety, large, in shape conical, a very fine-flavored berry; one slight objection to it is, that the core adheres so firmly, that the fruit is apt to separate in picking; canes strong and well covered with prickles; a good family berry, but not suitable for market unless it is quite near, as the berries are soft and will not stand carriage.

Fill Basket: in size very large, obtuse conical shape, color crimson, fair flavor, but dry, very strong canes thickly covered with spines; this variety would, on account of its size, make a very good market berry, but it is not productive.

Knevet's Giant: in size equal to the above and similar in color; strong growth, not so prickly and a better bearer; with us it proved hardy and well worthy of cultivation.

Scarlet: said to be very superior; we failed to see anything remarkable in it; medium size, color bright red, canes strong and quite free of spines; this is all that can be said in its favor.

Franconia: an old French variety, large, color dark red, very good flavor, productive, and would make a good market berry, if it was hardy.

Huntsman's Giant: a seedling from the Franconia, and similar to its parent; the canes grow taller and are covered with a white bark, quite productive, and said to be hardier than its parent; a decided acquisition.

Harnet: very large, crimson, good flavor, productive, but tender.

Brinckle's Orange, this is without doubt, one of the finest flavored raspberries in cultivation; this variety is not to be confounded with the old yellow Antwerp; it is different in its habit of growth; in color it is a rich orange, of delicious flavor, vigorous growth, and quite productive, but requires protection; it is the best yellow raspberry in cultivation.

Rivers' Monthly: medium size, crimson color, juicy and of good flavor, productive, but not equal to the Belle de Fontenay; require protection.

Naomi: a new highly-puffed variety from Ohio; we have failed to find wherein it is any better than many of our discarded kinds; the fruit is of fair size, no flavor, hardiness not yet tested.

Pearl: a native variety, medium size, color bright scarlet, sweet and juicy and of good flavor, canes short and spiney, suckers freely, and is quite hardy.

Arnold's Hybrid: these varieties are the first hybrids I have seen, at least the first that have been produced by a direct effort of the grower; they are a cross between yellow Marvel, of four seasons, and red Clitto, and the American yellow cap; fruit like the former, plant like the latter; the fruit is of fair size, good flavor, and said to be hardy; if it proves so it will be a decided acquisition, and take the place of Brinckle's Orange.

Belle de Fontenay: fruit large, shape long conical, color deep crimson, and of good flavor, apt, when fully ripe to drop to pieces; this is usually the case with the first crop, but the second crop, in

October, is not so liable, probably on account of the cool weather; we have had this variety, in open seasons, bear until December; it has been considered a great nuisance, on account of its tendency to sucker, but it is hardy and retains its foliage until extreme cold weather, and the fruit when preserved retains its flavor better than any other kind; on this account it is valuable.

Downing: a seedling raised by the well-known pomologist; fruit large, color crimson, strong canes, tender.

Davison's Thornless: similar to the Blackcap, but it will prove a greater favorite with the ladies, as they can pick the fruit without having scratched hands, torn dresses, and ruffled tempers; the canes are perfectly smooth; it is not quite as strong a grower as the Doolittle, the foliage is pretty, the edges of the leaves being crimped, it ripens a few days earlier, and is the best of the Blackcaps.

At the conclusion of this paper, the thanks of the Club were tendered to the author

## CATTLE DISEASE.

Mr. J. B. Lyman.—We have with us to-day a gentleman who has done the world a service by his investigations of the cattle disease, and I take pleasure in introducing to you Professor John Gamgee, of the Albert Veterinary College, London.

Prof. G. said that he had devoted much of his life to the study of the laws of nature, respecting the life, decay and death of the lower animals. He expressed surprise at the great mortality in this country among the useful animals, from diseases entirely cureable. He thinks the loss to America from this source alone amounts to twenty or thirty millions of dollars annually. He spoke of epizoötic diseases and the rapidity with which they are introduced from one country to another. He alluded to the hog cholera and to the tapeworm, and spoke of the mysterious law of animal life that often makes it necessary that man and the nobler animals should die to perpetuate the vilest and most repulsive of worms. A tapeworm throws off eighty millions of eggs. Fortunately all but one of them generally perish. Else the higher animals, man included, must perish of this most loathsome disease. Much of his attention had been devoted in England to the arrest of traffic in diseased cattle, and the stoppage of epizoötic maladies, but of late he had been studying the possibility of carrying slaughtered animals from one continent to another, in a fresh and palatable state.

He believes he has discovered an art by which an ox killed on the Savannahs of Texas, may be eaten as fresh beef in New York city, and the poor of London and other great European cities may have an abundance of fresh mutton slaughtered on the great plains back of Rio Janeiro, or near Melbourne in Australia. He considered the whole subject of a supply of wholesome animal food as one of some importance in social science as well as in agriculture, and hoped at sometime to have the honor of explaining his process more at length, and showing the Club a specimen of superior fresh mutton slaughtered several months ago in England.

The Club expressed their appreciation of the address of Professor G. by voting thanks unanimously, and asking him to name the time when they could have the pleasure of hearing him more or length. Professor G. intimated his willingness to appear before the Club on Tuesday next, at 2 o'clock.

### DRAINING.

Mr. J. M. Stoker, Madison, Lake county, Ohio.—Experience has with me, established a few general principles in regard to the underdraining of land on clay subsoil. Water will not permeate clay, hence it is no benefit, except to put tiles out of the way of deep plowing, to dig deep into it. The clay thrown out of the drain must not be used to cover the tiles; if it is so used the water will probably stand in pools on the top of the drain in less than a year. I have seen it do so. The surface water being all the water to carry off by drainage from clay subsoils, underdrains are better than open ditches, the latter being in this latitude always rendered inefficient by the action of frost, causing the sides to cave in, besides being obstructions to agricultural implements passing over the soil. Land on clay subsoil is much benefited by thorough drainage; surface water gravitates to the clay where it remains stagnant, if the stratum is horizontal; if sloping, it obeys the same inevitable law until it finds a natural outlet, drain or open ditch. Wherever stagnant, the temperature of the soil is reduced, which injures the crop. The benefits of the underdraining are found in an increase of the average temperature of the soil, which is supposed to greatly benefit the crop. It is not known that underdraining adds any element but heat to the productiveness of the soil.

### HUNGARIAN WINE.

Mr. Jacob Kohn exhibited some bottles of Hungarian wine, which was highly approved by the Club

### HINMAN'S CAR AND TRACK FOR REMOVING HAY IN BARNS.

Mr. Homer W. Fitch, Lithgow, N. Y., exhibited a machine for unloading and mowing away hay, which appeared to possess several meritorious points, and was decided to be an excellent and almost indispensable assistant to the farmer. Adjourned.

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## March 3, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### FLORIDA.

Mr. Solon Robinson, Jacksonville, Fla.—We have some frost here; ice has been seen twice. As I write, people are working their gardens. Forty miles south, on the coast, tomatoes have been growing all winter. The soil in this place is sandy, but largely composed of powdered shells, giving the whole the appearance of buckwheat flour. Timber of all kinds grows luxuriantly, showing that the soil is rich. The growth of orange, fig, peach and various other trees is rapid. Weeds grow ten feet high upon the walls of earthworks, the dirt of which was taken from ditches ten feet deep. A crop of these weeds plowed under makes the ground sufficiently rich for sugar-cane. Sugar is to be the main crop of the State. I believe the time will come when vegetables and fruits will be grown along the St. Johns for the New York market, and they will be fully two months earlier than the products of New Jersey. The whole country is emerging from a wilderness. Land is worth from fifty cents to fifty dollars an acre—the first is swamp, yet frequently as dry as any other. The Florida railroad give away lots to actual settlers.

The dearest lands are orange groves, the trees of which are worth from fifty dollars to one hundred dollars each. Commercial openings offer, such as buying up the old Spanish land grants and selling them again in small pieces, and also in manufacturing, loaning money, or engaging in the insurance business. Cotton planting has failed. Laborers are abundant. The climate on the whole is healthier than at the North. Still, one is subject to fever and ague, &c.

Though the heat is of long duration, it is not so intense as in New York. The blacks are peaceable, though they pilfer some. as all ignorant people do. One coming hither, should attend to farming and let politics entirely alone.

People have got the orange fever high, and seem to be dreaming of sudden wealth. More trees will be planted this year than ever before. The immense plantations of olden time are now dense forests, and even large villages and missions have become entirely obliterated. Whoever comes here expecting to find a paradise will be disappointed.

Dr. J. E. Snodgrass thought people going thither should be cautious, for unless they get acclimated, they cannot stand the climate. He had known people go to Panama for their health, and they seemed to get better for a time, yet afterward, on returning to a colder climate, they suddenly sickened and died with the Panama fever.

The Chairman said he was carried on shipboard several years ago, surrounded by his friends, who never expected to see him again. He weighed only ninety-one pounds, but after a residence of six months in Florida, he returned, weighing one hundred and thirty-four pounds, and has been gaining ever since.

### RHUBARB WINE.

The Club unanimously adopted the following resolution:

*Resolved*, By the Farmers' Club of the American Institute, that the selling of common rhubarb or pie-plant, in its different varieties, as a *wine plant*, is an attempt to deceive and to defraud the people of this country.

Mr. Wm. S. Carpenter.—I am glad this resolution has passed, but it is not strong enough. This wine plant is more than an imposition. It contains none of the properties of wine, and it is injurious. Hundreds of barrels are brought into this city, and sold from twenty-five to fifty cents per gallon, and is used to adulterate other wines.

Mr. A. S. Fuller.—I am glad to see this subject introduced. Other miserable wines have been encouraged.

### THE DISEASES OF ANIMALS.

Prof. John Gamgee, of the Albert Veterinary College, London, read the following paper on the diseases of animals, which was listened to with profound attention:

*Mr. Chairman, Ladies and Gentlemen:* In the few remarks I made last Tuesday, it was my desire to impress on your minds that sickness and suffering were quite as essential to the working of nature's system as the healthy growth and development of the numerous members of the animal kingdom. But I wished you to understand that whereas disease and death were quite inevitable, we were apt in our ignorance or carelessness, to overlook many things which teach us how to prolong the lives of men and animals and others, which indicate how speedily and surely the more important plagues might be exterminated.

It would doubtless be more interesting to many present, if I could illustrate my subject by special reference to the diseases which are ever prevalent on American soil; but the very circumstance that it is not possible for any one to speak with very great authority on that which has not been sufficiently observed should not be lost on you. We need facts. Your interests are suffering, and the interests of every man, woman and child in the United States are suffering for want of statistical and geographical knowledge in relation to the diseases of animals. Every now and then we are startled with news of thousands of cattle, sheep or pigs dying in some part of your vast continent; but the evil strikes at a State, a county, a nook in your fertile lands, and the loss seems to be soon repaired in forgetfulness.

I have heard it stated that every emigrant who lands on this side of the Atlantic is worth $2,700 to your country. The advantage to you of emigration from Europe may be estimated at or about $30,000,000 per annum. You will correct me if I am wrong, but I trust I am not far from the truth. Now, I told you last week that your losses by disease in cattle must amount at least to thirty million golden dollars per annum, or in other words, you lose by inattention to the laws of health in animals as much as you gain annually by the importation of human life from the Old World.

This may be a peculiar view of matters, but if you consider my statement fair and correct, you will probably see that it is my pleasure and duty to talk to you of subjects that are not second in importance to any that engage your attention, and that I am the member of a profession which deserves better patronage and consideration at your hands than it has hitherto received.

You must not suppose that this is the first agricultural assembly which I have accused of inattention to agricultural and social interest. My countrymen refused to listen until they had bought experience by one of those rude shocks which seem destined by Providence to make men wise and better than before.

The soil at home covers hundreds of thousands of animals which should have fed our people and enriched our country. When, in 1864, the British government attempted to check the traffic in diseased animals, in accordance with my recommendations, the farmers not only stood aloof from the project, but openly denounced it and its authors. Their interests they thought were not those of the general public, and if plague destroyed their stock, it was right and proper they should be saved from ruin by selling their dead and dying cattle to the people.

This short-sightedness was soon manifested when the cattle plague was carrying off its five, ten and fifteen thousand animals weekly. They were compelled to bury their carrion then, and they found themselves not only, in too many cases, bankrupt in pocket, but the objects of sympathy, seeking relief from associations to which liberal donations were given by our nobility, craving indulgence at the hands of the landlords, and asking government for compensation for slaughter stock—stock slaughtered to check the rapid progress of contagion.

Had the farmers of the United Kingdom been wise in time; had my profession held a better position in our country, we should not have been laughed at by our neighbors, the French, who got the plague indirectly through us, but who could boast of a knowledge and an organization, whereby the most fatal and devastating of animal pestilences could be held in check.

I am, as an Englishman, proud of much that is good in the British farmer, and of the advanced position of British agriculture. Last week I told you that improvements in our system of tillage, the reclamation of waste lands, drainage, liming, and similar processes, are tending to diminish the amount of local or indigenous diseases on our soil. I am, therefore, not blind to the good, although I have been placed frequently in the unpleasant position of having to deny the evil of that system, which has doomed us to an annual loss of many millions sterling. Theory has been loud and long continued with us for more and for cheaper food; and yet, for a whole quarter of a century, we have persisted in a foreign trade in live animals, conducted on principles so bad that it has entailed on us a loss of not less than two of our superior British animals for every single one that has traversed the German ocean.

Do not, I pray you, fancy that the conditions under which you enjoy life here are so very far different from those which prevail in the old country. The life of an American, if I can read you rightly, is a life of great enterprise and activity. You live faster, accomplish more in a short time, and sometimes lose quicker than we do. I have been charmed with the evidence of a general appreciation of the value of knowledge, but it is in your very natures and necessities to prefer practical and readily available knowledge. You can command an almost limitless space—limitless in relation to your numbers at present—and to drive the mighty engine of progress and civilization at the pace you wish it driven, it is essential to have ready and efficient power.

It is this that encourages me to hint at, for, having to be brief, I cannot speak satisfactorily of means which are destined to favor the rapid increase in the number of your animals—means neglected, though needed and beneficial to the whole world, and which in the first instance are calculated to satisfy your wants and enhance your prosperity. If that man is a benefactor to the human race who makes two blades of grass grow where there was once but one, how much more is he likely to benefit humanity if he saves that force, preserves that life which has availed itself of the blades of grass, and has molded them to the wants and desires of his fellow men.

In fertile spots of the country, where the grass may be tied over the back of a horse, the problems calculated to interest you are those which refer to the conversion of vegetable into animal matter. The conversion can only take place by increasing the reproductiveness, the health and the vigor of animals. We must prolong their lives, or we must so utilize them that the full benefit of the land's produce may be felt by mankind. Amid plenty we are in want, and there is no better illustration of human weakness and the folly of human ignorance than the exuberance of life in one part of the globe, the abundance in certain regions, as contrasted with the want, the poverty, the hunger in others.

Since I landed in New York, I have been asked many questions concerning maladies which materially interfere with the increase and improvement of live stock in this and other States. It may seem to some that from the fact that there are more animals than can be eaten in the New World, a few lives more or less are of little moment; but there are those present who will bear me out in the statement that the losses are falling and have fallen very heavily on the most enterprising of your stock raisers; and enterprising men in this country go on and accumulate wealth, and with their experience and ready cash, move on to new and fresh fields of labor and plenty, and attract around them the poor, the destitute, who would die in the dens and hovels of European cities rather than pitch their tents in what often seems to deserve the title of wilderness.

Your live stock is dying, its reproduction is materially checked where it is of highest value, because nearer your great markets; and I have already seen enough to convince me of one fact, viz: the casting of hoofs and fracture of bones, the withering and destruction of calves yet unborn, the wasting and drooping of flocks which have attained maturity, are one and all due to ignorance of the conditions necessary to the cultivation of wholesome grasses. You may think this strange, but the diseases of animals teach us some very remarkable, and, at first sight, apparently conflicting truths. I can show you soils, equaled by none others in our country, farmed by the ablest men with skill and judgment, and on which enormous crops of roots and cereals are annually raised.

For some years all seems to prosper, when suddenly cattle in preparation for our Christmas markets—cattle worth thirty pounds and forty pounds a head—drop dead one by one, and by twos and threes, of diseases, which, when once manifest, are incurable. How tantalizing to have been liberal with manures, unsparing in labor, and unremitting in attention, and then to see the finest stock in the world destroyed as effectually as if some miscreant maliciously killed it, and at the same time rendered it totally unfit for human consumption. The secret of so much waste and so much loss is found in the peculiar nature of food, of our root crops especially, raised on good soil, and used to the exclusion of other foods for the feeding of animals.

Nature has intended that we should supply the systems of men and animals generally with a definite combination of materials suited to their wants, and in excess of their requirements. It is usually easy to indicate, on the appearance of such diseases as I am speaking of, on the appearance of anthrax, of apoplexy, of what farmers have called shoots of blood, how they may be prevented. Overlook, however, one or two important facts which the veterinarian, the chemist, the comparative pathologist can teach you, and the diseases rage year after year, to the complete destruction of some of the richest tracts of land. Is it not true, therefore, that for want of some veterinary knowledge we find poverty and want where there might be abundance and riches? The chief indigenous diseases of farm animals in the United Kingdom are due to the luxuriance of pastures, and the want of exact knowledge as to means whereby foods may be combined and qualified for the preservation and improvement of the animal economy. I could detain you long on the subject of mixing foods, and even on that of occasionally mixing medicines with food, but I hope to do this in a more satisfactory and practical manner than it is possible for me to do it to-day, after I have traveled and gained American experience.

While on the one hand you can understand how much every one might be benefited by the prevention of diseases I have alluded to, you must, without any difficulty, be enabled to appreciate that the readiest way in which I could serve you is in suggesting means whereby the cattle and the sheep, the swine and the poultry of your endless prairies and Mezquite grounds may be rendered available where human beings congregate in hundreds of thousands, and even millions.

Fancy how greatly your arts and manufactures would flourish under any system which provided readily the blood and sinews which are essential to their development. Prosperity is at hand if we can keep our laborers in ease, comfort and contentedness by an abundance of food. When hunger and poverty come in at the door, love flies out by the window; and if this be true too often of matrimony, it is truer still of that bond of unity and affection which is essential to the well-being, harmony and prosperity of a community.

You have been expecting me to talk of the process whereby the meats of Texas and Florida may be supplied at low rates to your Northern cities, and I think I can say there are many now in New York who have had not only ocular demonstrations, but the proof of the pudding is in the eating, that we can keep carcasses of animals and improve them; we can ripen them and increase the delicacy of their flavor, by a method of preservation which has been as yet one of the great necessities of the age. I am, perhaps, bolder in speaking thus after having eaten, on this side of the Atlantic, mutton that I packed on the other side, than I should have dared to have been before; but we have experimented fairly and successfully, and I stand up, without fear of contradiction, and declare that if the beef and mutton of certain regions is better than in certain others, that beef and mutton will not lose by transporting, but rather have the time for its perfection and improvement. Those who have devoted much attention to meat preservation have adopted a great variety of plans, which may be succintly stated as follows: 1. Desiccation and fumigation. 2. Salting and packing. 3. Cooking and preserving, either in hermetically sealed cans or under a coating of an impervious protecting material. 4. Freezing. 5. Preservation in air-tight cases containing neutral or antiseptic gases. 6. Condensing or extracting the nutritive principles of animal food, as by Liebig's and Borden's process.

It has always been my object to secure for our large dead-meat markets the entire carcasses of animals, and we have succeeded to our entire satisfaction in packing carcasses while yet hot, and keeping them so that they might be exposed to a high temperature and the open air of any country, without danger of putrefaction. We cause animals to breathe a gas which sends them to sleep. We bleed and dress their bodies as usual, and then place them in air-tight receivers, from which the air is abstracted. We then fill the vessel with carbonic oxide gas, and open a communication between the chamber in which the meat is contained and another chamber, containing a small quantity of charcoal charged with sulphurous acid. By this means the meat is fixed, and, if hung up to lose a little of its surface moisture, it remains unaltered for months.

I hope to have the pleasure of meeting you here again, when I can show you not only English mutton, but the animal produce of your greatest cattle and sheep-rearing territories; and, while I have no doubt we may expect some people to start up and appropriate some of the information which, in obedience to your patent laws, we must publish, you will freely accord us the priority in devising a new and efficient system, whereby the meat of Texas and the pampas may freely be exchanged for gold in New York and London.

I prize the acknowledgment of this fact as much as, if not more than, other benefits which are likely to accrue from a new trade, a new branch of commerce, and the only branch needed to civilize lands which, in fertility and vastness, exceed by far the more densely peopled portions of our globe.

The Indian recedes with the buffalo; the African is subdued and jungle cleared by the riches, the enterprise and pluck of the white man. There is no object calculated to inspire action or motion in these directions, so promising or alluring, as the cultivation of the soil and rearing of live stock to minister to the comfort and wants of mankind. The more easily the stock is transported, the more rapid must be the onward march of civilization. I am here to learn more than to teach. I trust to be set right if I have been in error on any point I have discussed so briefly and inadequately to-day, and conclude by hoping that you will benefit me with your counsel and advice. And I likewise trust that henceforth you will all strive to do more than you have done for the veterinary profession, for the New York College of Veterinary Surgeons, and for the diffusion of information as to the amount, nature, and prevention of diseases of animals in America.

At the conclusion of Prof. Gamgee's address, Mr. J. B. Lyman introduced the following resolutions, which passed unanimously:

*Resolved*, That in the opinion of this body the presence in this country of Prof. John Gamgee, of London, for a period of several months, presents an opportunity of which our General Government should certainly avail itself, to secure the services of one of the most learned and distinguished veterinarians of the world—one who stands foremost among his brethren in the knowledge of infectious and contagious diseases among animals, and who, we are profoundly impressed, would be able to do our country important service in investigating and reporting upon some of those ailments which afflict our agriculture, among which are hog cholera, the Spanish murrain, big-head in horses, abortion in cows, and others that may be named.

*Resolved*, That we commend this subject to the consideration of Hon. Horace Capron, Commissioner of Agriculture, in the hope that he may be able to devise a way in which it may be accomplished.

Mr. James M. Allen read the following paper on

## THE MOWING MACHINE, HOW TO SELECT AND HOW TO RUN IT.

When I volunteered to read a paper on farmers' machines, I did not take the attitude of an instructor of those old machine philosophers who may be in attendance or read my remarks; nor yet, of those who never had a machine and never expect to have one. I thought only of those who use machines and have suffered, or may suffer sore trials and vexation of spirit in running them.

I thought of sawing machines, threshing machines, plowing machines, &c.; but when I began to pencil down my thoughts, I found my theme had too many branches for one presentation to compass all. And, as mowing machines, including reapers, are more numerous than all the rest together and give farmers more trouble, I will confine my essay to them, in hopes of suggesting a way of relief to some one who may be in trouble about buying or running his machine.

To show the importance of my theme, I will glance at the number of these machines now in use in the United States.

We have no reliable information of the number of machines made or in use in 1850. It must have been very small—probably less than 5,000. Nor did the rapid growth of this branch of manufacture begin soon after that date. Not till 1855 did it assume noticeable proportions. But in 1864 there were, in the United States, one hundred and eighty-seven establishments, making this kind of machines, many of them of great extent, substantially built, completely furnished with power, machinery, tools, all of the best kinds and styles, and the work beautifully and wisely systematized. The population sustained directly by these manufactories, amounted to about 60,000. The product was of the value of $15,000,000, the number of machines being a little short of 100,000. From this pivotal point we may run back, grading downward, eight years, and run foward, grading upward, four years, and the sum will represent the number of machines now in use after subtracting for those worn out and abandoned. Suppose we run it down at ten per cent per annum, and up at the same rate. This gives about 1,130,000, made in the twelve years, and would justify us in saying that there are 900,000 now in use, and more than that number of families blessed and made happy by their well working, or afflicted and distressed by the perplexities attending their use. On this account I claim that my theme—how to select a mowing machine and how to run it—is important, whatever may be said of my manner of treating it. I will now call your attention to that substantial farmer in Ohio who is just gathering his hundred tons of hay. His men are filling the barn as he comes bustling in from the meadow, all aglow with heat, and dripping with perspiration from every pore of his great body, for he weighs one hundred and eighty pounds, avoirdupois.

"What's the matter, Uncle Joe?"

"Oh! that boy don't make headway in mowing out there! He won't cut five acres a day at this rate, and he ought to cut eight, at least."

"Don't he work?"

"Work? I should think he did work—he's all in a sweat, and the horses too. He drives up like Jehu; but, you see, every time he comes to one of those soft, thick grassy places, the machine chokes right up tight, and won't go through. Then he backs out and jumps off, and pulls out the grass, and fixes and fusses and oils up—then he gets on and cracks up the horses again! Fact is, something's wrong with the boy, or the plaguey machine, I don't know which. Why! I got on that thing with him and drove once round, just to show him how to do it, and it went well enough—then I gave him the lines, rode round once with him and it cut right through without a bit of fuss. Then I got off, and would you believe me! that boy did not go twenty rods 'fore he was choked up again as bad as ever!"

"Well, Uncle Joe, I will go out to the field with you and take a look at your machine—perhaps I can find out the difficulty. Two heads, you know, are better than one, if one is a —."

"Now see here! This machine has three varieties of motion—progressive, rotary and vibratory. The machine, you see, follows the horses across the field—that is progressive motion; the wheels all turn round—that is rotary or circular motion; the knife moves to and fro in the same channel—that is vibratory motion."

"Yes, I see."

"Now, which motion works the gearing and knife?"

"The circular motion, I 'spose."

"Very well; now suppose the circular motion ceases for only an instant, what will happen?"

"Why, the knife will stop, of course."

"Well, what is it that keeps up the circular motion of these driving wheels?"

"Why, the horses, I 'spose."

"Not exactly that, Uncle Joe. Suppose they were smooth-faced wheels and on the ice, and you held them back a little with your hand, would they roll on?"

"No, they'd slide."

"Then you see that it is friction, or, as it is generally called, 'traction,' on the ground, that makes them turn around."

"Yes, I see."

"It is the same thing that makes a locomotive wheel revolve and enables it to draw the cars; but if you destroy that traction by greasing the rail, or by removing the weight from the wheel, you know what happens. It won't draw the load. Just here, too, is the difficulty of making a machine that will move along with four or five plows in the ground. Obed Hussey found this out at a great cost. It can't be done. Now, your machine weighs only five hundred pounds, you say, and runs very light, only two hundred and fifty pounds draft. Now, let us see what it is that makes this two hundred and fifty pounds resistance to the horses: 1st, the simple inertia of the matter constituting the machine; 2d, is the friction of the gearing largely increased by the arrangement for increasing the velocity; 3d, is the friction of the knife in its channel; 4th, is the friction of the finger bar on the ground; 5th, is the resistance of the grass on the fingers as they pass through it; and 6th, is the resistance of the grass against the edge of the knife as the cut is made. Now, while friction, as I said, is the means of procuring your power in first moving your gearing, it is, from that point onward, the destroyer of it. Therefore, let me urge you to increase it at the first point and destroy it after that. And when you buy your next machine, look out for this very thing. You see you must have weight to create the power, but that weight does not increase the friction of the gearing, or of any other part, if it rests *only* on the drivers; and now you see why you and the boy *both* could make the machine run through the bad places, while he alone could not. It was not your skill, but your *weight* that did it. A bag of stones of the same weight would have done just as well."

"Yes, I see."

"But that you and others may understand this matter better, I will show you a few figures. The motion of your team and driving wheels is too slow to cut grass. Your knife must move quick and spiteful, therefore velocity must be increased. Now, there is an irrepealable law of nature, that if anybody wants velocity they must pay for it in force or power. Your initial velocity (that of the team) is, we will say, three miles per hour. All horse power machinery must conform to this speed. That is 261½ feet in a minute. On that space your thirty-two-inch drive-wheels make thirty-three revolutions, and as your knife has a forward cut of three inches at each stroke, it will make 1,056 strokes in 261½ feet, and in one minute; and as each stroke is four inches in length, your knife has traveled 369 feet while the horses have moved 261½ feet—a gain of over one-third in velocity, and a loss of one-third of your force.

"Next is friction in the gearing, which is often reckoned as equal to one-third of the power; and here comes the other resistances alluded to, so that finally your force, represented by 250 pounds draft, and 500 pounds weight, which is pretty nearly all spent before you get the edge of your knife against the grass. And at that point you need a force sufficient to cut an hundred and forty-four square inches of grass (your bar being a four-feet bar), and at the same time overcome the inertia of your knife and pitman, weighing from twelve to fifteen pounds, *i. e.*, stop its motion at each four inches and start it again. Uncle Joe, I don't believe you've got five pounds of force in that knife more than you need to cut upland grass. In fact, I doubt if your whole force would move a twenty pound weight against the knife. So you see I am in favor of heavy machines, or else a machine with a weight on it, like yourself or your equivalent in pot metal or stones. Because the velocity being limited to that of a walking horse, we have no way to increase the momentum but by increasing the weight. Again, you see, I want the knife and pitman and their connections as light as possible. And again, I want the drivers to have a wide rim and a large diameter, because it gives more surface for traction, brings to the ground more calks to hold on and keep that point still, while the rest of the wheel moves around it as the axis of motion; and because a large wheel mounts obstructions easier than a small one. Then I want the shafts well fitted to the boxes on short bearings; the cogs narrow and perfectly matched, because small surfaces have less friction than large ones; and in regard to the finger bar, I want it carried by a *lifting* connection with the main frame, and not by a *pushing* connection; because the one elevates it over lumps, stones and hillocks, and at the same time gives the weight lifted to the drivers for power, while the other presses the bar *against* the ground and into the hillocks, and lifts just so much weight *off* the drivers and wastes it."

"Yes; I see; but I have got a truck wheel to carry the bar and make it run easy."

"Yes, of course you have, but all you can say in favor of that is that it keeps you from 'running the thing into the ground!' The tendency is just the same—the force is in the same direction. I admit that the little wheel makes a bar in such a position carry easier, for I am not sure it would go at all without it, but I have an objection to it anywhere. You see the knife has motion in two directions: One drives it right and left, the other carries it forward; and so the knife, acting in obedience to nature's law, moves in a direction between the two—a diagonal direction. Now, your little wheel gives it an irregular motion in another direction, viz: up and down. This is the very worst direction you could give it, because it prevents a regular or smooth cut, and makes a notched stubble. On a perfectly level surface, of course, this evil would not occur.

"Here allow me to inject a few words upon the idea of a sloping or sliding cut about which some have ventilated their ignorance.

"A sliding cut may be desirable, but does not appear to be attainable, on account of the natural law referred to. If our knives had parallel edges, our present arrangement would, in conformity with that law, produce just that kind of cut. But parallel edges and our present arrangement are incompatible.

"Now, Uncle Joe, I have told you and your neighbors these things so that you will not only buy good machines, but will know how to run them, and understand the importance of taking care of them, and keeping them in order for work. I need not tell you that rain and sun and dirt are not to be allowed on them, or that it is folly and cruelty to lash up your horses to make your machine cut; you can't make it cut any oftener to one revolution of your drivers. Its law of motion was established by the maker of it. But I say to you, care for it; watch it as you do your purse or your expense account, and for the same reason. Watch it for the sake of the hard-worked, brain-tasked manufacturer, who has begotten you such a wonderful assistant in your toil and sweat; watch it for the sake of your dripping, panting team, and if

'Mercy to him that shows it is the rule,
And righteous limitation of the act
By which Heaven moves in pardoning guilty man,'

I exhort you to take care of it for the sake of your own future peace and well being."

At the conclusion of this paper the thanks of the Club were tendered to the author.

### TO PREVENT BRICK HOUSES SWEATING.

Mr. David Goodall, St. Johnsbury, East Vt.—A brick house in this climate, with a solid wall, makes a most uncomfortable abode—cold and damp in winter and hot in summer, and none are so built of late times. I built a one and a half story brick house eight years ago, carried up two brick walls four inches apart inside, tied together with twelve-inch pieces of thin hoop-iron laid in with the brick, each wall four inches thick, the width of one brick. This vault opens into the cellar, and is carried up to top of chamber rooms, and ventilators put in so that I have a circulation or draft of air constantly from the cellar through this vault. I have double windows in part of the house, and that part is almost impervious to the heat of summer and cold of winter, and perfectly dry.

When the thermometer goes below twenty-fives degrees, frost forms in the rooms not used, on the outside door and window jams, but never in the rooms when we have fires. Another way is to stud up next the wall inside (the wall being solid) with four-inch studding, and plaster on this, thus forming a four-inch space of dead air. Were I to build again, I would have a two-inch vault in the wall and two-inch studding, which would make a perfect wall and cost but little more, since plastering on a wall here requires much more mortar and time than when laid upon lath.

### CEMENT WATER PIPE.

Mr. J. U. Abel, North Clove, Dutchess county, N. Y.—Six years ago, I had a cement pipe laid, one hundred and twenty rods in length, down a slope and across a running stream, at a depression of sixty-five feet below the fountain, thence up an elevation of twenty-eight feet, furnishing my yards amply, and at a point on the wayside for the public, with good spring water. I dug the ditch three feet deep, and sixteen inches wide at the bottom, leaving it as smooth as may be in the center. Now the tools were, a rod eight feet long, made round and tapering about one-sixteenth of an inch, of hard maple—any kind of wood that will wear smooth will do. Through the larger end, which was one inch and one-eighth in diameter, should be a spike or iron two inches and a half long, to aid in turning the rod while in the cement. The smaller end was extended six or seven inches by means of an inclosed piece of buckskin stuffed with cotton, tacked firmly and even with the surface of the rod, its flexibility enabling the laying of the pipe on a curve. Next, a box or trough eight feet long, two inches and a half wide at the bottom, three inches across the open top and sides, and three inches and three-quarters high. A measure containing a trifle over one-third the cubical contents of the above box or trough, for measuring the cement and fine sharp gravel, will be required. One brick and one plastering trowel, together with the end of a small hogshead about one foot high, in which to mix, are all found necessary, aside from the tools to fill the ditch. I used the gravel from the bed and sides of streams, passing it through a sieve that would admit a small pea. Now to two parts of this gravel I added one part of cement, mixing it thoroughly before, and grinding it well under the hoe after, adding the water. Wet the trough and fill with the mixture, pressing it in with the brick-trowel; pass the trowel along the sides of the trough upon the inside to the bottom, and the one end which should be closed. Have a man at each end to lift it in the ditch, laying it one side of the center; turn it over in the middle, press down the rod immediately in the mixture to within three-fourths of an inch of the bottom; now, with a trowel in each hand, and by walking backward, press the mixture well against the sides of the rod the whole length; then work it over the rod evenly, and of as nearly equal thickness as possible; commence filling on each side of the pipe, packing the dirt with the feet to the height of the pipe; then cover it over with care, observing that no stones fall and puncture the mixture while soft. After covering it a few inches deep, turn the rod gently once or twice to prevent the cement adhering too freely to it; fill up the ditch, draw out the rod, and proceed to mix up as before, observing to leave a little in the tub with which to add to the joint or connection; after pressing down the rod, slope down the mixture a little at the end each time. Wherever you wish to bring the water above ground, insert a lead pipe in the side while the cement is soft; work a small flange on the end of the lead, that the cement may hold it firmly; run it up a post with a gain cut in it sufficient to receive the pipe; nail a board over the gain-side of the post; box it around about one foot square, fill it up with buckwheat chaff, and I deem it secure against frost, if you have a good supply of spring water, and, for aught I know, for a century, so far as the cement is concerned. Do not admit water in the pipe for two or three months after it is finished, unless of a very light pressure. Place a fine strainer over the pipe at the fountain. At this place a short piece of lead or iron pipe is convenient for starting. Two men will lay and fill about eight rods of the ditch per day, which will require about one barrel of cement. If a pipe of less caliber and light pressure, of course proportionately less material will be required; hence, the cost is easily arrived at in any locality, if the prices of labor and cement are known.

Mr. N. C. Meeker.—The above is the old method, having been in use twenty years and more. Livermore's patent of 1866 has a sheet-iron pipe, lined with hydraulic cement, and also covered with it, and the company in Massachusetts puts down one inch and a half pipe at five dollars a rod; one inch, four dollars; twelve inch, thirty-three dollars; and it is in use in many cities of that State. More is charged if the head of water exceeds thirty feet of pressure, for it seems the greater the pressure, the thicker must be the pipe.

### A NEW HARROW.

Mr. N. Starr, Homer, N. Y., exhibited a new harrow. It is made in two sections, or parts, each shaped like the outlines of the common V harrow. It is so constructed with iron joints, that it can be taken apart in a few minutes, when it can be carried in a small wagon. The principal feature is, that it adapts itself to ridges or dead furrows, working in all places equally. Either section may be provided with cultivator teeth.

Mr. Carpenter.—This seems to be a good thing. The cultivator attachment is important; and, on the whole, I think it is a valuable invention. A committee was appointed to test its merits.

### PETROLEUM GAS STOVE.

C. M. Young & Co., of 476½ Broadway, showed their petroleum stove. It was fully described, and the precise way in which the gas is generated and consumed clearly illustrated. The Club paid more attention to this patent than to anything that has been exhibited before it for a long time; and remarks were made as to the importance of introducing a cheap material for kitchen fuel. Most of those present were well satisfied with the stove and the fuel employed in it; but, as some doubts were expressed, the Chair appointed J. B. Lyman as a special referee, to use the stove, experiment with it, and report its merits and demerits at some future meeting of the Club.

### GEERS' CHERRY PITTER.

This was exhibited by Mr. Burson, and it attracted much attention. It is simple and cheap, and if it will work as claimed, it ought to go into general use.

### FRUIT GATHERER.

Mr. Darling displayed a new and ingenious contrivance for spreading beneath trees so as to catch fruit, as it is shaken down. and conduct it to baskets or bags placed beneath.

### STRAWBERRY BOWL.

Mr. Gurnsey exhibited a new strawberry basket made of veneer, and constructed so as to be strong. They cost about fifteen dollars per thousand. Mr. Carpenter and others thought it an improvement in the right direction. Adjourned.

## March 10, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### MUCK AS A MANURE.

Mr. James L. Wadsworth, Windham, Portage county, Ohio, wants the advice of the Club as to whether it will pay for him to haul muck three or four miles, and whether it is a cheaper and more potent fertilizer than clover.

Mr. Horace Greeley.—As this is a relative question we must know, in order to answer him properly, the cost of hauling muck that distance, and whether he must take it up. I have hauled a great many hundred loads of muck, and it seems to me that three miles is the extreme as to distance from which it will pay to haul this substance. I recommend by all means that he fertilize his land and make it as productive as possible; but the question is whether he cannot do it cheaper by plowing under clover than by hauling muck over three miles.

Mr. A. S. Fuller.—My experience is decidedly in favor of fertilizing by the use of muck. Some years ago, when I left the city, I bought a poor piece of land. It was so poor that the weed called five-finger never had but three fingers. I have put about five hundred loads per acre of muck upon it, and now it is just as good land as I want. It will produce anything. For me the clover system would not have worked. It takes four or five years to bring up a piece of land with clover, but one will do it with muck. Another advantage, I hire by the year, and get my labor cheaper on that account. Then, in winter the standing order is to haul muck. If the weather is too severe, I do not send out the team. But, as a rule, my men are occupied all winter in hauling muck. They spread it over the land as they haul. In the spring it is harrowed in thoroughly and mixed with some other manures. In this way I get a fine, rich soil, that will do anything I want of it, and I do not think my muck costs me over twenty-five cents a load.

Mr. F. K. Phœnix, of Bloomington, Ill.—This advantage of muck over clover, that it can be applied in winter when hands would be idle, or nearly so, is one of great importance. Would it not be well for farmers to inquire into the cost of keeping their teams in winter steadily engaged in this kind of hauling?

Mr. Horace Greeley.—Mr. Fuller's acres must cost him five hundred dollars an acre. Can we advise the common grain-growing farmer to enrich his land at this cost? As to hauling it up hill, it is the broken country that is well supplied with muck. As to the cost of hauling, that depends, too, on the wetness of the muck. It should be dug, and allowed to become as dry as may be during one summer, and hauled in a dry condition.

Mr. Wm. Lawton.—The superiority of muck over clover consists in the fact that it can be applied in winter, when other farm work is impossible; but clover takes time in that part of the year when the farmer's time is worth the most. My team is engaged in hauling muck every winter. I mix it with other manures, and find it an excellent fertilizer, especially in growing trees and small fruit.

Prof. Nash.—As to the relative value of muck and clover as fertilizers, I would say that when muck can be laid on a surface at a cost not much exceeding twenty-five cents a load, it is more economical than clover. But I suggest the use of both; the clover brings some elements that muck does not, and on the contrary muck is rich in some acids that are not in clover. Hence, I would recommend that he combine the systems. Thus he will be sure to keep in his soil that which our agriculture is so rapidly exhausting, the vegetable mould.

Mr. Wm. S. Carpenter.—The result from clover can be obtained in a short time, and a man will not have to wait so long as one would suppose for clover to make the ground rich.

### ROOT-GRAFTED APPLE TREES.

J. D. Conklin, Locke, Cayuga Co., N. Y.—With that subject of root-grafting I am familar, and I practiced it till I saw I was waring against natural laws that sooner or later must be avenged, in a feeble, sickly constitution or a want of fruitfulness, so the prospect would be much greater to root-graft than to work on whole seedling stocks, because the former would produce from two to five trees from a seedling at three years old, and the work done in the winter, whereas, only one perfect tree can be produced from one seed. Let us look at an apple seed when placed in the ground—at that time a dormant speck, with no signs of life, but under the influence of the sun and rain it soon gives evidence that in that seed is stored the germ of life, and the first action of that seed is a root that descends into the ground, and under favorable circumstances, as in sand or moss, quite a growth is attained before the leaf is in sight. Now, would the advocate of root-grafting think of taking the lower end of this root at this age, and make a tree of it? No, and why not? Because they say it lacks vitality as well as size, and yet the lower end of the root for half its length, and also the top with the leaves, might be removed without very greatly injuring the plant, because the seat of life—its vital part—still remains undisturbed. I have examined this subject for the last twenty years with some care and much solicitude, and must therefore enter my protest against the almost universal habit of root-grafting the apple, as a speculation that falls heavily upon the planter of orchards. Hence, the wide-spread complaint all over the country of orchards dying prematurely or yielding no fruit; and this complaint will continue until we are willing to be governed by laws that are laid deep in the counsels of wisdom, that teach us that one seed can produce only one healthy, perfect tree.

### CULTIVATION OF USEFUL TIMBER TREES.

Mr. Henry Rupp, Shiremanstown.—The cultivation of forest trees for timber for building, fencing, and many other purposes, does not receive the attention it should. Our forests will be swept away; the rapidly increasing population of our country requires increasing supply. Improvement will be impeded, our farms will become fenceless, unless we are fortunate in procuring or inventing suitable substitutes. Every person could have timber trees enough to keep the farm in fences, without inconvenience to farming operations. True, we see many trees scattered over many farms and especially along fences, but they are of little value. Nearly all timber trees, especially locusts, chestnuts, maples and many others, when cut away will be followed by young shoots which grow rapidly, and if grown singly and protected from stock will make tke finest trees. Every farmer should consider whether it will not pay to plant a few trees on vacant spots and along fences, and whether he will not be doing a good work for his posterity. Trees planted at proper places will greatly protect the growing crops of grain and fruit, and in various ways benefit individuals and the country.

### REFINING OF SORGHUM SIRUP.

Six vials of sirup were sent by Mr. Ruel Ambrose, of Manchester, Michigan, with a letter requesting the Club to express an opinion as to which specimen is the best. The testing of these vials was referred to a committee, consisting of Messrs. Lyman, Fuller and Meeker:

### WHEAT AND CORN.

Mr. George A. Deitz, Chambersburg, Penn., exhibited, through one of the members, packages of the celebrated Weeks wheat, the white chaff Mediterranean, the production of Diehl wheat, some Tuscan wheat, and a sack of the white hominy corn, which those present took home to plant.

Mr. P. T. Quinn read the following paper on

## MANURES.

It would be recklessly turning aside from the well-trodden path, if, at the outset of my remarks, I did not assert that the subject of manures is closely allied to the wealth, prosperity and happiness of the American farmer. Nor must I lose so fair an opportunity of declaring that some if not all of the ancients were familiar with what we term the most approved and economical methods of collecting, composting, and applying fertilizers. However, it is not a part of my plan in this present paper to give a detailed account of the history of manures, but to present to your consideration instead, some plain practical remarks on the application of manures, their uses and abuses.

There is no doubt that a thorough system of deep culture will materially reduce the annual outlay of fertilizing material. It is equally certain that our drafts on the soil are larger and more frequent than our deposits. Sooner or later the over-taxed and ill-used soil will refuse to produce annual and paying crops.

To fully illustrate this important subject and the close relations manures bear to the producing capacity of our country, I will direct your attention for a few moments to the consideration of soils, their origin, formation and composition. All soils are the debris of underlaying or adjacent rocks, and, when speaking in general terms, are classed as clay, limestone, sand, or a mixture of two or more of these substances.

Soils naturally fertile (or capable of producing maximum crops, without manures), are found to contain not only the above-named substances, but also a certain percentage of decayed vegetable matter, and several mineral ingredients, in minute quantities, which ingredients are always in combination with other substances, and are known as phosphates, sulphates, carbonates, etc. Although these form but a comparatively small proportion of the weight of loose soil on an acre, still their total absence would render it barren, and when any or all of them are not available to the growing plants, maximum crops cannot be produced.

It is no longer a disputed point among intelligent agriculturists, that in order to make farming profitable, the mineral ingredients abstracted from the soil, by each successive crop, must be replaced in an available condition, or else the average yield, instead of increasing, lessens every year. The question naturally arises, how can the farmer produce the largest crops, at the least expense, and at the same time improve the quality of his land.

It is self-evident that the present average yield per acre is but a fraction of what could be produced under a thorough system of tillage. The ruinous system of owning large tracts of land, scratching over the surface, and scantily manuring, has long been, and is still a national evil. It is my firm belief, founded on experience, that if all the manure and labor, now ineffectually squandered in this way, was applied to one-quarter of the present cultivated area, the aggregate yield would be double, while the expense of producing would be lessened at least one-third. Who can say that he really knows the capacity of an acre of ground. On our farm I have grown on a single acre eight bushels of oats, and in less than four years the same acre produced eight hundred bushels of carrots. Another field, that had never yielded more than twenty-five bushels of shelled corn to the acre, has by a similar mode of treatment frequently produced eight thousand marketable cabbages, and this too, at a very moderate expense, and a handsome profit.

The market gardener, with thorough culture and heavy manuring year after year, annually produces three crops of vegetables from the same piece of ground, either one of the three abstracting from the soil more nutriment and relatorily of more value than any of the cereals. Nor is it unusual for the gross receipts for an acre, cultivated in this way, to range from $600 to $700 each year. I don't mean by this that every farmer should turn gardener, but I do mean that the average yield of our staples could be doubled, yes, quadrupled in many cases, by adopting the gardener's thoroughness of culture. Cultivate fewer acres, and cultivate them well. Let your motto be "How much manure can I use with profit," and not "With how little can I get on." I believe it was Ralph Waldo Emerson who said that a basement story belonged to every farm in Massachusetts which the owners know little about, and the sooner the acquaintance was made the better for the individual and commonwealth. The same remark is more or less applicable to every acre of arable land in the country.

If the mass of farmers would fully realize this fact and act upon it, our agricultural resources would be incalculably increased. As land-owners and farmers, we should estimate our acres by the cubic instead of the superficial foot.

A deeply-rooted impression pervades the farming community that draining and subsoiling are intended simply to assist in carrying away stagnant water. This, of course, is an important object, but is trifling in comparison to the advantages arising from aerating the soil, and hence developing the natural resources of the lower stratum. There is no doubt that the man who cultivates his farm to a depth of from eighteen to twenty-four inches, will produce larger crops, at less cost for fertilizing material, than he who scratches five or six inches deep. While the former insures his crops against the effects of protracted drought, the latter leaves his at the mercy of the weather. This, then, is the first important step towards improving the land, by developing its natural resources, a step, too, that every man may take who owns five or five hundred acres. Like all other branches of industry, the art of husbandry requires that care and caution should be exercised in carrying out the details, in order to secure the best results without incurring unnecessary outlay. Many instances could be given to prove the assertion that deep culture is in every way the truest economy, but perhaps one may suffice. During the year 1865, we contracted to supply three hundred tons of cabbage at a fixed rate per ton. The summer proved unusually dry. No rain of any account fell for six weeks, and in many sections of the country the crops utterly failed for want of rain. However, our cabbages grew vigorously, forming solid heads, certainly giving no signs of want of moisture or food. This I attributed solely to deep culture. The roots penetrated into the earth, out of the reach of the drying winds and hot sun, to a depth where they found enough moisture and food to supply the wants of the growing plants. Although already fully persuaded of the fact that less manure would produce larger results with deep than with shallow culture, that season's experience more than convinced me on this point. With thirty-five dollars' worth of manure to the acre, on land thoroughly drained and subsoiled, the yield was 2,100 pounds more cabbages than where fifty dollars' worth was used on land that had not been drained or subsoiled. Every practical farmer knows that on a summer fallow more grain can be produced with less extraneous fertilizers than on ground constantly cropped, because during the summer the atmosphere, rain and dews penetrate the loose soil, carrying with them agents that facilitate the development of the plant food, rendering it available for the forthcoming crops. In short, there is no doubt that increasing the depth of your soil you increase its capacity. Theory and practice never disagree here, and we farmers should see to it that in this matter practice and preaching form an equally close partnership.

Manures have a two-fold action on the soil. The first is mechanical; while they are undergoing decomposition the soil gradually becomes porous, particles of earth are separated, and their surfaces are exposed to the action of the atmosphere and rains, always productive of good results. The knowledge of this fact induces farmers to apply long and unfermented manures to heavy clay lands, also to turn under grain crops, such as clover, buckwheat, peas, etc. Although the latter practice may in many cases prove an expensive way of producing the desired results, still the effects are always satisfactory. The second action of manures is chemical, or that of furnishing plants with the necessary food to maintain healthy and vigorous growth. In those districts of country where mixed husbandry is pursued, homemade manures should receive constant care and attention. Nothing should be permitted to go to waste, and a careful husbandman will occasionally add such material as will enhance the value of the natural manures of the farm and render them more general in character. The manure heap is the farmer's working capital, and much will depend upon its economical management. In feeding plants, as in feeding animals, the best results are obtained by having quantity, quality and divisibility.

Barnyard manure is not all alike; it differs in quality just in proportion as the food of the animals is varied. It is not good policy to depend solely on the manure made on the premises. If there is a muck bed within convenient distance, haul the dry muck to the barnyard, if you can do so at an expense not exceeding a dollar a cord. Add a bushel of lime, or better still, the same quantity of the well known salt and lime mixture to each cord, and in due time compost nine cords of this compound with one of barnyard manure, and the ten loads will equal in value the same bulk of barnyard manure, load for load. When farmers ask me which is the best fertilizer, I invariably answer homemade barnyard manure. No farmer can afford to let his yard manure go to waste, and then make up his loss by purchasing artificial fertilizers. But, on the contrary, only the farmer who places a high value on the resources of the yard and augments the manure heap by every available substance that will add to its efficacy, can afford to invest money in commercial manures. Under these circumstances he can each year safely and profitably invest a portion of his capital in the purchase of reliable kinds. Mineral food cannot be appropriated by plants except in solution. There is no doubt that the most economical method of applying manures, is to reduce them to a liquid. However, this method is not always practicable, and in default we must avail ourselves of the next best plan of receiving equal distribution. In case the ground is very rich, it makes but little difference whether the manure is decomposed, but if the crop has to draw the whole or a large part of its sustenance from the manure as applied, then thoroughly rotted manure is the best. The maxim, "What is gained in speed is lost by power," is as true in agriculture as in physics. Farmers that desire immediate effects no longer rely on unfermented manure, or coarsely ground bones, but use instead manure fully decomposed, and bones ground to the fineness of wheat flour.

The section of country lying south of the Potomac, including all the Southern States, has for many years depended mainly on Peruvian guano. But, strange as it may seem, the farmers in many parts have lost confidence in its reliability. Not that it fails to produce large and quick returns, but because its stimulating effects on the soil are found to cause a sure deterioration year by year. The land, productive from its temporary excitement, as it were, becomes exhausted of its inherent vitality, and, to produce the same yield, a constantly increasing amount is demanded every season.

Agriculture and political economy say the same thing on this point. Sooner or later Southern planters and Northern farmers will find it in every way to their profit to depend on ground bone, superphosphate of lime and fish guano. The bone and superphosphates are well known, but the latter should be in more general use. It is two-thirds as valuable as Peruvian guano, and the price per ton is only one-third as much. It is a valuable fertilizer, and deserves the attention of our farmers. At this point the query may arise, "What constitutes a good fertilizer?" This is fully answered by giving the constituents that are found in the ashes of cultivated plants. Phosphoric and sulphuric acids, potash, lime, soda and a few other mineral substances of minor importance. In connection with these, to secure a good fertilizer, a certain percentage of matter should be present that on decomposition will yield ammonia. After phosphoric and sulphuric acids, potash and lime are the most important. The former can be procured from various sources, such as marl, wood ashes, etc. The latter, although found but in small quantities in the ashes of plants, still acts a very important part in the soil as a destroying agent, hastening decomposition of all inert vegetable matter. Practically, I have found the best results from lime by frequent surface application in small quantities, from twenty to twenty-five bushels to the acre. It should always be burned before application, and burnt lime left thus exposed soon becomes an impalpable powder, securing perfect divisibility. In this state it is often found to produce noticeable effects even on lime soils. Common salt can be spread broadcast at the rate of eight or ten bushels to the acre, or, better still, can be added occasionally to the manure heap in small quantities.

To sum up, the farmer should prepare his soil properly to receive generous supplies of manure. He should in every case use every available fertilizer at hand before going from his own farm for manure, and when he does seek it elsewhere, he should know enough of the nature of the soil and of plant-life to select his manures with a view to true economy and adaptation. I say true economy, for I do not dignify the pitiful and short-sighted dread of outlay, still inherent in the farming community, by any such name. The genuine farmer is as open-handed and far-reaching in his plans as the merchant. His fields are his ships; if he freights them well, they will bring him sure returns. If he puts laziness and parsimony in command, he will sooner or later be wrecked, or, what is worse, he will drift into sluggish waters that no tide can ever enliven.

At the conclusion of this paper, the thanks of the Club were tendered to the author.

### KANSAS.

Mr. T. H. Walker, Topeka, Kas., delivered an interesting address on this State. The soil from the Missouri, for two hundred and fifty miles, is loam and sand; beyond that the country is not tillable without irrigation. The State is said to be subject to drouth; owing to the dry season in 1860, the people, just arrived, called for assistance; but since that time the seasons up to July have a plenty of moisture, and the crops are abundant. The grasshopper did limited damage, and these are the only drawbacks. Spring and winter wheat do well, and also grapes. Corn is the principal crop, and yields from forty to sixty bushels per acre. All crops should be planted early. Potatoes are successful on sandy land, and on loam when mulched. It has taken some time to learn the peculiarities of the soil and climate. Peaches have been wonderfully successful, and apples yield abundantly. Surface coal crops out over most of the State where the prairies terminate in bluffs. Stone suitable for fencing and building is abundant, and one variety is easily sawed into blocks like wood. The Osage orange is planted largely, and hedges can be constructed and guaranteed till suitable to turn stock, at forty cents a rod; after that there is a State bounty given of five cents a rod for eight years. The natural grass starts early, and by June the poorest stock gets fat. Cattle buyers from Illinois come to the farms to purchase, and the home market is good. The railroads are all well endowed; five hundred and twenty-five miles are built; the Pacific road is laid three hundred and twenty-five miles; the Atchinson branch one hundred miles, and will unite with the Omaha line at Fort Kearney. One road is building from Lawrence to Galveston, and there are others also. The school grants of land are very large, and school-houses and churches are numerous.

### THE ROOTING OF HOGS.

Mr. M. Metz, Bucyrus, Ohio, sends the Club a specimen of an awl which he names "Swine's Jewelry," which is to be inserted in hogs' snouts, and thus prevents rooting.

Mr. Horace Greeley.—A good farmer never tries to prevent his hogs from rooting, and I protest against such an instrument being used.

The Chairman.—A hog will earn fifty dollars during a summer in loosening the ground. It is heresy to undertake to improve on the works of Divine Providence.

Mr. Wm. S. Carpenter.—A slit made in a hog's nose, when young, will prevent his rooting.

### NITRO-GLYCERINE FOR BLASTING.

Mr. John Lillie, Fort Wayne, Ind.—Can the Club tell whether nitro-glycerine may be profitably used instead of powder, for blasting?

Prof. Tillman.—Yes; but it should be made near where it is to be used, and only about as fast as required for immediate consumption. Both gun-cotton and nitro-glycerine undergo a slow spontaneous decomposition. For this reason the use of the former has

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lately been abandoned in the Prussian army. The saving in using nitro-glycerine arises from the fact that it is several times more powerful than gunpowder, and consequently requires a hole of less diameter than that drilled for the reception of powder. If the amount of rock to be removed is large, it will pay to use nitro-glycerine; but if it is essential to use the limestone raised for building purposes, the object will be best attained by using gunpowder.

### FLAX CHIVES.

Mr. H. C. Randolph, Plainfield, N. Y.—Are flax chives good for mulching blackberry bushes? Some say they injure plants, others say not. My soil is a clay loam.

Mr. Wm. S. Carpenter.—Yes; and when rotted they make good manure.

### HARVESTING IN CALIFORNIA.

Mr. T. Woodhaus, Santa Clara, Cal.—An account of harvesting in California may interest many of your members. The climate of California (no rain in the season of harvest) is peculiarly favorable to securing the crops by machinery. The cereals are the only crops raised there to any considerable extent—wheat being the principal crop, and yielding from fifteen to as high as forty bushels to the acre, or even more in some locations, but that is not common. The great disparity between the price of labor and the products of the harvest, as compared with the East, may account for the waste we often make in the hurry of harvesting in California. The account of my harvesting, as given below, is a fair specimen of the usual mode of harvesting. Threshing is always included in the harvest work, as much as the reaping, and is done in the field where the wheat grows. Where the grain stands up, and the land is tolerably level, it is harvested with a clipper; this requires a force of ten horses, seven men, and three large box wagons. With this force, I enter my field, the clipper going in front of the horses, cutting a space eleven feet wide, which is thrown on the elevator belt and carried up into the accompanying wagon. As soon as that is filled another takes its place. It takes three wagons and seven men to keep the clipper going and stack the grain. The stacks are made ten to twelve paces square, and near enough together to allow a thresher to stand between them. I was eight days in thus getting cut and stacked ninety-eight acres, and paid two dollars an acre, and boarded the hands. Once stacked, it may safely stand some weeks till we get a thresher. The grain that is fallen we cut with a reaping machine; that is usually found, though not always, on account of the scarcity of hands. The threshing is done by horse and steam power, the large jobs mostly by steam; this takes a force of nineteen men, six on a stack each side of the thresher to get the grain up to the feeder, one to hook on and take off sacks, one to carry them away, engine-feeder, machine-tender, straw-hauler, sack-sower, and water-cart man. The price for threshing is usually four to five cents per bushel of sixty pounds of wheat, the owner of the thresher furnishing four hands, who go with the machine. The farmer finds the other hands. Wages, last harvest, two dollars to two dollars and fifty cents per day and board. I was five days last harvest threshing 2,300 sacks of 100 pounds each, and moved engine and thresher eleven times.

### EGG-HATCHING MACHINE.

Dr. A. Preterre, 159 Bowery, invites the members of the Club to see his egg-hatching apparatus, which is now in full operation. Chickens are being tumbled out of the shells every day; and thus far the success has been quite satisfactory. The doctor has recently invented a delicate apparatus, by which the ringing of a bell indicates either the maximum or minimum degree of heat to which the eggs and the young chickens are exposed. If the eggs are liable to be injured by too much heat, or if not enough heat is applied, a little bell gives an instant alarm. This enables the operator to adjust the temperature at pleasure. Hens can now devote all their energies to laying eggs, and thus save twenty-one days of tedious incubation, and more than forty days more of maternal care in rearing their little broods.

Adjourned.

## March 17, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### SMALL FRUITS ON THE HUDSON RIVER.

Mr. John W. Staples, North Newburgh, Orange county, N. Y.—There are frequent inquiries from men who want to find homes in the country, and with good society. It is hard for those accustomed to Eastern, and especially to city life, to bid adieu, apparently forever, to accustomed enjoyments and associations. Here, in Marlboro-on-the-Hudson, is room for one thousand families, where parents and children can find ample employment and good pay in the small fruit business, and this within sixty miles of New York city. I came here a few years ago with my family, and with a small capital, to get a support and to improve my health, and have gained both. The land is well adapted to pears, strawberries, raspberries, currants, gooseberries and grapes, which are extensively raised. Last year the products of the town were about five hundred thousand dollars, and the business can be increased a hundred fold. A good plan will be for a large number to purchase a large farm of fifty or one hundred acres, to be set with fruit. Only a small advance will be required. In the third year there will be full crops and large profits, which will build each family a small cottage. Mr. S. goes on to show that there will be a net profit every year of two thousand three hundred dollars from five and a half acres. Besides this, many vegetables can be raised. Much more is added, and mainly to show that it is better than to go West.

Mr. N. C. Meeker.—This is a good opening, but it requires not less than one hundred dollars to put an acre in small fruits, and it is necessary to understand the business. Fruit-growing is far from being easy; in the shipping season it is like running a threshing machine. Our friend's plan, that several should unite and get a large tract, is the true way. Fruit-growers lead on civilization more than any other class; as a class, they never have existed anywhere till in this age. But they are wanted in the vicinity of one hundred and fifty cities in the West, as well as around New York. Wherever they are, they should be in a body, so as to learn from each other, and while they do so much to make land valuable, they ought to own enough to have a hand in the speculation. Wherever cultivators of the soil get rich, it is as much through the rise of the price of land as by labor. When a settlement of fruit-growers bring small pieces of land into a state of high cultivation, the one who owns the adjoining land, and lets it lie idle, makes the most money.

### KANSAS.

Mr. Amos Gore, Clarkstown, Rockland county, N. Y.—I have attended the Club for the purpose of communicating some of my experience of a Kansas life.

In a statistical account lately published, it is stated that the number of emigrants to the United States, since the year 1860, exceeds the amount of killed, wounded and disabled during the late civil war, so that the exhaustion from that source has been more than supplied.

The motive power which keeps up this sustained exodus from Europe, is found in the want of disposable land in Europe, and its high price.

If this is a fact, does it not behoove us, who are farming on lands year after year, with barely a return of what we expend, to sell our high price lands here and migrate to the West, with the proceeds buy land and stock our farms, where we would suddenly become independent?

I believe that, after six years experience that I have had in Kansas, a man can do better in that State than he can in any other in the Union.

Having traveled through Missouri, Wisconsin, Illinois and several other States, I found that while in Illinois quite a colony was migrating to Kansas, where their friends had been but three years, and had accumulated more money than they had for eight or ten years before.

Kansas opened to settlement 30th of May, 1854; admitted as a State January 29, 1861; is 207 miles wide, north to south, about 400 long, east to west; between latitudes thirty-seven degrees and forty degrees; about 80,000 square miles; 50,000,000 acres, one-half yet unsurveyed—millions of acres open to homestead and pre-emption. By an act of Congress, any citizen can get eighty acres of land within the limits of the railroad, and one hundred and sixty acres outside of railroad limits, by living on it five years and paying about eighteen dollars office fees. Government price of lands, pre-empted, per acre, two dollars and fifty cents. Lands in second hands, from one dollar and twenty-five cents to five dollars; timber, five dollars to twenty-five dollars.

The Union Pacific Railroad Company has any amount of lands, which they offer at reduced rates, on credits from four to ten years, and free from taxes for six years. Some of their lands are of the highest order.

The Kickapoo Indian Reservation, in a line of the railroad, situated twenty miles west of Atchinson, is a tract containing upwards of 150,000 acres.

Those lands have been appraised from three to fifteen dollars per acre, average seven dollars; are of the highest order. The soil is of inexhaustible depth, and unsurpassed fertily for agricultural and stock-raising purposes.

The best school system has been adopted in and through the State.

The best natural roads are found in Kansas. Railroads generally convenient; ground moderately undulating; about five hundred and eighteen miles of railroad in running order; climate unsurpassed; no swamps, no bogs, nor marshes. Air rarified and dry—good for diseased lungs. Average winter only three months. Wheat was sown through the month of December last. Soil from one to twenty feet deep, producing great crops of grass and grain; water and stone are abundant. Wood and coal are sparse, but the State pays you for raising your own wood and making your own fence.

Where you can cut from two to two and a half tons of the best hay to the acre. Where you raise from thirty to fifty bushels of corn without tillage, and doubled if well tilled. Where the largest yield of wheat is had over any other State (*Patent Office Report*). Where all kinds of cereals grow accordingly. Where vegetables are grown in abundance, and the highest price commanded at your door. Where all kinds of fruit are grown at pleasure. Where wild fruit, such as plums, grapes and small fruits are plentiful. Where buffalo and antelope abound, and where small game and fish are had at the expense of trap and fishing line. Where stock-raising is of the highest order, and all who have followed it for the last five years have become wealthy.

During the last six years I have spent in Kansas, I have had opportunity of collecting many valuable statistics, as well as getting some substantial facts from experiments. I shall be happy to contribute to the interest of any who may wish to migrate to Kansas. I am no agent, nor in the employ of any party to send emigrants to Kansas; but believe it to be a great moral duty I owe to my fellow man, to try to better his condition.

Mr. A. S. Fuller read the following paper on

## CULTIVATION OF FOREST TREES.

Eight years ago, I had the pleasure of reading an essay before this Club, upon the subject under consideration to-day. I then called your attention to the importance of not only preserving those forests which we still possess, but to that of rearing others for future need. The hundreds of letters that I have received since that time, asking for further information upon the subject, have convinced me that our people are slowly but surely awaking from that careless indifference which has in many instances not only permitted, but aided, in the destruction of some of our most noble and valuable forests; and these, too, on land that is comparatively worthless for other purposes.

Instances are not wanting to prove that thousands of acres of valuable timber are annually destroyed by men who have no use for the land after the trees are removed; at least they possessed more acres, that are already cleared, than they could properly cultivate. I do not now refer to the cutting of timber that is required for building or fuel, but to the many instances where the sole object of its destruction was for the purpose of allowing the proprietor to obtain a slightly lengthened view from his dwelling, or, that which is more probable, pampering to that foolish weakness, which is far too general among land-owners, of having it said that he possesses a few more acres of land. The first act of a settler in a timbered country is to clear away the forest so that he may have land to cultivate and produce the necessaries of life. But he does not stop when he has accomplished this, but continues to cut and hew away at the forests, as though it was the only object of his life; and, as each monarch of the old woods falls to the earth, making it tremble with its weight, he imagines that the echoes which come back to him are so many plaudits to his industry.

With many of our people, destruction is synonymous with improvement. And there is no doubt but that the destroying of forests in our Eastern States has become a matter of habit with our people. The grandfathers, and, in a few instances, the fathers, of the present race of farmers, cleared land because it was actually needed for cultivation; and as each successive generation imagined that it was incumbent upon them to make further improvements, they readily followed in the beaten path made by their ancestors, forgetting that an act which might show great wisdom at one time, would be foolish imbecility at another. The young man builds his dwelling upon elevated ground, and probably clears away the trees because they obstruct his view, and he values *prospect* more than *protection;* but later in life he will sigh for a few of those grand old trees to shield him from the burning sun of summer and the keen blast of winter.

Is it not passing strange, that a majority of mankind find no useful lesson in the history of the past, but continue to travel in the channel which has been worn wide and deep by previous generations, in their downward course to destruction? Entire countries have become barren wastes in consequence of the destruction of their forests; nations have become impoverished, and those beacon-lights of greatness — the arts and manufactures — extinguished; and the sole cause was the scarcity of wood. And yet, in regions where it is now plentiful, the same improvident waste is going on, as though the supply was inexhaustible, and that no deleterious effects would result from a total annihilation. It would be folly for me to attempt to estimate the value of forests to any country; for it is beyond the comprehension of the human mind.

The rain and dew that refresh and support vegetation; the rivers and rivulets that pour down from the mountains and hills, often owe their very existence to the great forests. This view of the subject, you may say, is only visionary and theoretical. Be this as it may, I would remind you of one simple fact, and that is: all we know of trees, or are likely to know of them, has its origin in the great primeval forests. It is by studying the natural distribution and characteristics of the different species that enables us to cultivate them successfully. We learn from nature that certain species of oak flourish far better upon a heavy, moist soil, than in one of an opposite character; and the same is true of almost every other genus. The chestnut prefers the old red standstone regions, and avoids the limestone, while the reverse is true with the hard maple and beech. The elm and soft maple grow more luxuriantly in the low alluvial soils near our rivers, than elsewhere. By further investigation we find that the quality of the wood is greatly influenced by the soil upon which it is grown. For instance, hickory that grows upon a sandy soil is far more brittle and less valuable than when grown upon a rich, deep clay; but just the opposite of this is true in regard to the common locust.

We also learn from nature some of our most practical lessons in regard to the growing of trees from seeds. A few species ripen their seeds early in the season, and these must be planted very soon thereafter, as they will seldom remain sound until the following spring. This is particularly the case with the elm. Swamp and silver maple, or their seeds, ripen about the 1st of June; but the sugar and negundo maple do not perfect their seeds until autumn, consequently, they may be sown at that time, or preserved in any moist, cool place until spring. The different species of foreign maples, such as Norway, English, and Sycamore, ripen their seeds about the same time as our sugar maple, and may be treated in the same manner. Chestnut, oak, hickory, beech, black walnut, butternut, &c., all ripen their seeds in autumn; and I believe it is the best plan to sow them soon after being gathered, unless it be in sections of the country where the land is liable to be frequently frozen and thawed during winter.

In localities where the weather in winter is very changeable, all kinds of hardy tree seeds may be safely preserved in the following manner: Select a tight, strong box; in the bottom of this place a thin layer of sand; on this put a layer of seed; then a little more sand, and so on alternately until the box is full; nail on the cover, and then bury the box in the open ground, covering it a foot or more deep. A dry, sandy knoll is the best place, if handy; if not, set the box on the ground, and make a large mound of earth over it. The common sweet chestnut is generally thought to be a difficult seed to keep through the winter; but buried in sand, as I have described, it will usually be as fresh and sound in spring as when first gathered from the tree. I have also preserved the chestnut and similar seeds by packing in damp moss and then placing them in a cool cellar. Rats and mice are very fond of most kinds of tree seeds, and they should be placed beyond the reach of these pests of the farm and garden.

It is scarcely necessary for me to call your attention to the fact that forest tree culture can be made a profitable business—even more so, in many localities, than any of our ordinary farm crops. Neither will you expect me, at this time, to designate the best species or varieties for culture, inasmuch as soils, locations and markets differ very widely, and each may demand a particular kind. For instance, the common white birch is usually considered one of the most worthless species of native trees; still, near some of our manufacturing towns, where its wood is used for making spools, it commands a much greater price than oak, hickory, chestnut, and many similar kinds of timber. Even the much despised ailanthus, for some locations and soils, is a most valuable tree. It grows rapidly even upon poor, light soils; and although it does not attain a very large size, still its wood is well adapted to many other purposes besides that of fuel.

There are many other similar instances that might be named where the local value of a species is far above its general one. But all these things will be learned in time, and the most that we can expect at present is to call the attention of the masses to the importance of the subject, for we know full well that when our people become aware that there is a rich field open to them they are ready to occupy, and make it yield a full return. We have to regret that the art of planting forest trees has not received that attention from our people which its importance demands.

It may be said that, as it is a branch of horticulture, it is encouraged by nurserymen and all others who are engaged in the cultivation of trees. But I do not believe that arboriculture, will ever reach the high position which it deserves until it is studied and encouraged as a separate profession. With your permission, I will, at some future time, give a few practical hints as to the best methods of growing the different kinds of trees, as well as a list of the most valuable species and varieties.

At the conclusion of this paper the thanks of the Club were tendered to the author.

Mr. P. T. Quinn.—Eight years ago when Mr. Fuller delivered an address before this Club, he said (and I have often remembered it): "He who lives longest, hauls his wood the furthest."

Mr. H. B. Smith.—The State cannot do better than to follow the example of Massachusetts, and exempt forest lands from taxation.

Mr. Wm. S. Carpenter.—When woods are thin, if the large trees are cut down and allowed to sprout, the timber will grow thicker. Trees grow better after being transplanted.

Mr. Williams.—Old forest trees do not permit an undergrowth, and when pruned they take the dead rot.

Dr. J. E. Snodgrass spoke of the folly of cutting down trees in this city. The leaves absorb the bad atmosphere and preserve the rest pure.

### SWIFT'S FARM GRIST MILL.

This is an improvement on the old iron mills. The grinding faces have elevated knobs which match corresponding ones, and they must be superior to the old grooves. Various sizes are made commencing with coffee mills.

Mr. Wm. S. Carpenter spoke highly of the invention, but so much disappointment hitherto has attended this description of mills that the Club did not feel like giving general approval without experimental knowledge.

### SAP SPOUT.

Mr. C. C. Post exhibited a sap spout. It is made of metal, about four inches long; made to screw into the tree, and with a hook at the base on which to hang the bucket. It seems useful, and it can be made cheap enough to come into general use.

### METALLIC "HOLD BACK."

This invention is designed to take the place of leather hold backs or breast straps for double teams. The snaps are a new invention. The wear on leather breast straps by heavy teams is great. It is claimed that this invention entirely prevents the whipping of the the tongue, as is the case with chains.

### IMPROVED SHEEP SHEARS.

Mr. Henry W. Seymour exhibited specimens of his improved sheep shears. These have the advantage of being made from a single piece of steel, giving a solid spring; the stops are tempered so that they cannot wear away and let the blades lap, and the handles are widened to give an easier grasp. There is also a thumb piece, giving facilities when clipping the legs and head.

### HARD RUBBER ENAMELED HARNESS HARDWARE.

Mr. A. Allright exhibited rings, buckles, bits, and other metallic harness trimmings, coated with hard rubber and lined with silver or gilt.

The members were pleased with the claim that metal thus treated never rusts or changes by heat or cold. It is ornamental.

Adjourned.

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## March 24, 1868.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary

### TREATMENT OF COWS.

Mr. J. C. McKenzie, Woodstock, Vt.—I protest against the custom of crowding cows into tight stables with their necks between two planks and there kept twenty-four hours, and then turned out to drink water enough to last them the next twenty-four. It will do to tie a tree to a stake and carry feed to it, but a cow has legs, and should go and get it. During gestation they should have considerable exercise, and feed once a day in the yard or field.

Mr. A. S. Fuller said he had no doubt but that many cattle became diseased by not being watered often enough, and he cited instances to show that such was the case.

Mr. Wm. S. Carpenter.—I do not believe that it makes much difference, especially in cold weather.

Dr. J. E. Snodgrass.—It is absurd. Cattle need but little water if they are fed on roots, which yield eighty per cent of moisture.

Mr. Thomas Cavanach.—The dairymen in my neighborhood only water their cows once a day, and they are healthy.

### FISH GUANO.

Mr. Isaac Hicks, Hempstead, L. I.—Last year we experimented in raising corn by different methods, as follows: We planted ten acres with a drill, in two days. It was manured broadcast with well-rotted stable manure, at the rate of ten two-horse wagon loads per acre. To prove which would be the most profitable, we planted two strips, in different parts of the field, of six rows each in hills; all had the same cultivation, except the corn in hills was hoed. The rest of the field never was hoed, but kept clean with a two-horse cultivator. The corn that was drilled yielded one-eighth more than that which was not. Last year we experimented with fish guano. We took three strips of equal size (eight by fifty-eight hills). Each strip was manured with an entire load of well-rotted manure. Two strips were also manured with two dollars' worth of fish guano, from Greenport, L. I., in addition, and mixed with each load. None was put in the middle strip. The corn, after the fish guano was applied, grew ahead of all the rest, and the result at the harvest was two hundred and six pounds from the strip without manure; and from the strips on either side, where the fish guano was applied, the weight was four hundred and eighteen and a half pounds, and four hundred and thirty-five pounds respectively, making an average gain of two hundred and twenty-one pounds of ears, from two dollars' worth of fish guano.

Mr. Wm. S. Carpenter.—I value fish guano equally with bone dust or Peruvian guano.

The Chairman.—Large quantities of what are called white-fish are caught around Long Island, when they are steamed and pressed for the oil. The residue is used for guano.

### UNFERMENTED MANURE.

Mr. A. Reynolds, Davisville, R. I., wanted to know the opinion of the Club on the use of unfermented manure, hauled directly from the stables. It is claimed by many that it is much superior to rotten manure.

Mr. Wm. S. Carpenter.—I take exceptions to the practice. As a general rule, green manures are dangerous, especially for fruit trees, though. I grant it is good for corn. Farmers will gain in the end if they compost their manure.

### CUBAN GUANO.

Mr. White sent several bags of guano to the Club, for the members to try and report upon.

### REPORT ON PRESERVED EGGS.

Mr. Wm. B. Harrison said that the eggs which Prof. Nyce, of Cleveland, Ohio, presented to the Club for trial, were used in his family, and they could see no difference between them and fresh eggs.

### CRUELTY TO ANIMALS.

Mr. J. B. Lyman offered the following resolutions, which were unanimously adopted:

*Resolved*, That we, the members of the American Institute Farmers' Club, have observed with growing satisfaction the disinterested and unwearied labors of Mr. Henry Bergh, and the gentlemen associated with him as a Society for the Prevention of Cruelty to Animals.

*Resolved*, That for the disinterested motives which prompt such activity, for the humanity which such efforts display and which they cultivate in others, and for the fearlessness with which old abuses and detestable but long-established practices have been assailed, followed up and abolished, Mr. Bergh deserves the highest commendations from all classes and conditions of society; and, since the brute creation, for which he principally labors, are unable to express their sentiments, we deem it the more important that we, and all similar organizations, should give Mr. Bergh the fullest and warmest utterances of our approbation, and the admiration we feel for his conduct and his character.

*Resolved*, That in taking these steps for the defence of animals against the inhumanity of man, Mr. Bergh is acting in the spirit of the Divine commands: "Thine ass and thine ox shall rest and enjoy their Sabbaths;" "Thou shalt not muzzle the mouth of the ox that treadeth out the corn;" "Thou shalt not seethe a kid in his mother's milk;" "Thou shalt not see thy brother's ass or his ox fall down by the way, and hide thyself from them; thou shalt surely help him to lift them up again."

*Resolved*, That we pledge to Mr. Bergh our hearty coöperation in every step, measure or recommendation that he may suggest for the furtherance of the objects for which that society was instituted, and that we shall be happy to promulgate, so far as may be in our power, to the agricultural community, his views with regard to the proper treatment of all the domestic and inferior animals, believing, as we do, that no agriculture can be just and successful that does not respect the rights and provide for the comfort of the brute creation.

Mr. Wm. S. Carpenter.—I not only indorse this, but would call attention to farmers and others who sell their old horses, which have served faithfully for many years. A law should be passed to prevent this. I have a horse over twenty years old, and would not take five hundred dollars for him, nor indeed would I sell him at any price.

Mr. P. T. Quinn.—As an instance of the good Mr. Bergh is doing, I am glad to see that a law is now passing the Legislature of New Jersey to punish cruelty to animals.

### GRAPES.

Mr. T. M. Younglove, of Hammondsport, presented a box of fine grapes for distribution, which, considering their age, and having been kept in the same room with apples, were good.

### PLANTING ORCHARDS FOR FARM USE.

Mr. Andrew Bush, Setzler's Store, Chester county, Pa.—If you have not engaged trees of a trusty nurseryman, go to the nursery and select trees. Help to dig out all the roots you can. Keep them from the sun and wind; plant by the directions accompanying the trees. Rather than delay because you have no cash, borrow it. If you have an orchard thirty years old or more, and it is in its prime, plant another. Do not expect to keep up a supply of fruit by replanting missing trees in an orchard of that age, nor by planting big trees in fence corners. Select a piece of fresh ground, as near your buildings as may be convenient. One hundred apple trees, of proper varieties, will supply a large family, and produce a surplus to pay expenses with, and profit in addition. A rod apart is good distance. Plant a freestone peach tree between each apple tree, one way only, and between each peach and apple, small fruits. Cultivate the rest of the ground with hoed crops and keep in garden culture until the apples bear and the peaches decline, plowing no nearer than four feet to the trees; then lay the whole down to grass. Varieties: Two Bough, two Red Astrakan, four summer pie, six fall pie, twelve sweet fall apples, the rest winter apples, of the varieties most in demand, not omitting a proportion of those most productive in your own vicinity.

Mr. N. C. Meeker.—These directions are good. We doubt the propriety of planting peach trees among apple trees, because the peach requires high culture as long as it lives, particularly in the fore part of the growing season, but not so as to get a full growth. When an apple tree comes into full bearing, high culture is not beneficial, certainly not where the seasons are long. We would prefer to plant each in separate orchards—apple trees thirty feet apart and peach trees about a rod. It is difficult to cultivate the two kinds, with different kinds of branches and requirements.

Dr. Isaac P. Trimble, of New Jersey, read a long, able, but somewhat severe paper, on the course pursued by what is known as the Camden and Amboy monopoly. He endeavored to show that the illiberal course pursued by the railroad company which has a monopoly of the carrying of passengers between New York and Philadelphia, across the State of New Jersey, was one of the principal causes which prevented the rapid settlement of the eastern part of that State. He charged that company with using improper means for retaining their influence in the New Jersey Legislature, and preventing the chartering of other railways; but as the Club knew nothing of the course of that company except by the representations then made, and as it is not in the province of this Society to correct political abuses, however desirable it might be to bring the waste lands of that State under cultivation, the Club declined to take any action on the subject.

### OSAGE ORANGE HEDGE.

Mr. N. C. Meeker.—The following rules are for farmers who desire to grow their own plants and hedge. The seed should be of the previous season's growth. Soak your seed in hot water, changing the water daily at about one hundred degrees, and keep the seed in a warm room. After six or seven days, the seed can be placed in a shallow vessel, say six inches deep, covered with a wet cloth and stirred three times a day to prevent heating. As soon as the germs begin to appear, plant in seed beds, covered an inch deep, rolling the surface smooth.

The best time is at the beginning of corn planting. The soil must be moist, or the seeds that are not started will become dry and fail to germinate until the following spring.

The seed should be one inch apart in the row. The plants should be taken up in the fall, either with a sharp plow or a spade, tied in bundles of one hundred and placed in the cellar, with layers of earth, or put in pits like potatoes and covered from frost. They should be sorted in two grades, so that each size can be set together. The very poor plants should be thrown away. A bushel of seed will make from 60,000 to 100,000 plants.

*The hedge row.*—A border twenty feet wide should be plowed, first outward, so as to leave a dead furrow where the hedge is to stand. This furrow should be stirred as deep as possible, then give it at least two plowings to the center so that it will be slightly ridged with a deep mellow bed in the center. Harrow thoroughly. It is now ready for the plants. Stretch a line where the hedge is to stand, cut the tops from the plants to within two inches of the ground which will leave the plant about eight inches long, the root being six inches. The best tool to set with is a round-pointed steel dibble. With this make a hole, set in the plants with the left hand, and then thrust in the dibble near the plant and press the earth to it. A good hand will set three thousand plants a day in this way. You can use a spade or a sharp stick, but this dibble will save its costs in two days' work. One thousand plants set eight inches apart will make forty rods of fence. One thousand plants set twenty inches apart will make sixty rods of fence.

*Culture.*—The first summer the plants must have good culture. The plow and double shovel should be freely used so as to give a good growth. Keep all weeds down, and, when the growth is arrested in the fall, turn a heavy furrow against both sides of the hedge to prevent heaving out or winter killing by water settling about the plants. The second year they will require good culture. In all this time they are not to be cut or trimmed in the least, and if they have made a good growth, will be five or six feet high.

The fourth spring the plants can be cut a trifle more than half off, one foot from the ground, and bent down in the direction of the hedge. They should be pressed down as close as possible to the ground.

They are left to grow up from their now prostrate position, and will be so thoroughly matted together that nothing can get through them. By the above course, hedges can be made in four years from the seed, so strong that no domestic animal can go through them. With a thorough preparation of the soil and good plants, there need be few if any failures, and if there should, the fault can be remedied at the time of plashing by making a layer of a branch of the next plant.

The three-year old hedge left to itself, without cutting back, will make a good shelter, will turn all stock except hogs, and on the open prairie will make a first-rate wind break.

### BARK LICE.

Mr. Levi Wilgus, West Liberty, Iowa.—My trees are covered with insects. I have used lime water, but it does no good.

Mr. A. S. Fuller.—There are two kinds of tree lice—the bark and scale louse; the latter is worst, and when bad the tree might as well be cut down.

Mr. Wm. S. Carpenter.—One pound of potash dissolved in two gallons of water, makes the best remedy, when applied as a wash.

### GIRDLED TREES.

Mr. F. B. Doolittle, Delhi, Iowa.—I have had twenty-two years' experience in the nursery business, and find that girdled trees may be saved by applying grafting-wax to the wounds; but the cheapest and most practical way is to bank up with mellow earth and to make a mound large enough to accumulate moisture.

Mr. Wm. S. Carpenter.—Practical orchardists have never saved a tree when the bark has been taken entirely off in the winter. In June a tree may be completely girdled and no damage done.

Mr. A. S. Fuller.—Cut away the edges of the wound till a fresh healthy bark is seen, then take bark from the large limbs of any tree of the same kind, and cut the edges so as to fit the gap exactly, having the ends of the strips pressed against the fresh bark of the tree; wind the whole tightly with a bandage, and when circulation is active the sap will pass through the bark, and the tree will grow as well as ever; or twigs with sharpened ends can be inserted across, forming grafts.

Mr. P. T. Quinn.—I never knew a tree saved unless by Mr. Fuller's practice. People do not look closely. I know of a cherry tree supported on four grafts or pillars, while the inside is hollow and one can see through.

### DRAINAGE OF IMPERVIOUS CLAY SUBSOILS.

Mr. David Boyd, Lenawee county, Mich.—To drain impervious subsoils, we would recommend the following course: Let the field be habitually plowed into narrow lands in the direction of the principal fall. Plow as deeply as possible, and allow the plow to go down in the subsoil as far as possible, between the lands. These furrows may be filled by dragging or cultivating, but they will allow water to work-away into the underdrains, which should be at nearly right angles to the direction of these lands. There should be one main drain in the direction of the lands or of the principal fall. This drain will be located at or near either side or center of the field, according to the advantages that it may afford for relieving the cross-drains. Draining land in the direction of the principal fall is the worst possible method. Let the lands be plowed, as above suggested, in that direction, and furrowed-out deeply, and these furrows changed from year to year. The cross-drains need not be at regular intervals, but coinciding with the lowest lines of the undulations of the surface crossing the principal fall. Nor need these cross-drains be all at the same angle to the principal drain. They should coincide in direction with nature's deposits of the soil. Lastly, in impervious clay subsoils, where there are no springs, and where the object of draining is only to carry off the surface water, drains should not be deep; two feet and a half, in my judgment, will be sufficient. This will be deep enough to keep the tile (for it is tile I suppose to be used) from being disturbed by the plow.

### CEMENT PIPE.

Mr. S. L. Moffatt, Blooming Grove, N. Y.—In 1856, I laid fifty rods, with equal parts of cement and sand; ditch three feet deep, and wide enough to work in. I then made a mold of side-boards, eighteen inches long, four inches wide, four deep, fastened by a strap of iron across and near each end, to keep in place. To commence with, I used a short piece of lead pipe, put my mold in the bottom of the ditch, and filled it half full; then inserted a smooth, round stick into the lead pipe, filled up the mold, pressing the cement well with a trowel; then lifted off the mold, and withdrew the stick, and so proceeded. Adjourned.

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## March 31, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

Mr. Wm. A. Fitch read the following paper on the

### IMPORTANCE OF WEIGHING, IN FARM EXPERIMENTS AND SALES.

In farming operations there is uncertainty which the sharpest foresight cannot prevent, and which it can only partially modify. The weather during an approaching season is always an unsolved problem; the mysterious appearance of insects which may eat out the profits of a year's labor can rarely be forestalled; to foretell the changes in the market correctly requires almost prophetic power, and so of many points which contain elements of the highest importance in laying out plans and calculating chances for success. This acknowledged truth makes it all the more requisite to thrifty farming, that all ascertainable facts relating to its various operations be known and taken into account. The most inveterate guesser can find scope enough for his talent on the weather alone, without making his guessing faculty afford information as to the size of his fields, their rate of produce, the amount sold, or the profits of the transactions. Weights and measures, pens, ink, and paper are as indispensable to sure success in farming, as are plows, hoes, mowers, and reapers. They are emphatically tools for the use of the brains; the others pertain more to the muscular department. To illustrate by a few examples: One dairyman guesses his cows are doing pretty well; the flow of milk is good, and the amount of butter made is a fair average, as shown by the returns received from the buyer. The producer has not himself measured the gallons of milk nor weighed the amount of butter. He may make money; many do this without any system. Another dairyman, by a few days' testing with gallon measures and scales, knows the exact amount of milk and weight of butter produced by each cow; then he decides which animals to keep and which to sell—perhaps to his neighbor, who never bothers with weighing and measuring. He also can tell to an ounce how much butter shrinks in passing through the hands of a commission merchant, if such a thing be possible. Another case: Farmer No. 1 feeds his cattle until he thinks they are fat enough to turn off, sells them to the butcher at their estimated dressed weight, and pockets the proceeds. How much of the amount is profit, he cannot tell; he did not measure the feed nor weigh the animals.

Farmer No. 2 feeds out grain by measure or weight, and charges it to the bullock. At intervals of a week or more he rigs his platform scales so that the animal can stand upon it, notes how much beef it shows for the grain eaten, and when the feeding does not pay, sells to the butcher or drover. In doing this he is not afraid of the practiced eye of the buyer, which can almost fix the notch at which the bullock will turn the scale. He has consulted his unerring Fairbanks, and knows when the right price is offered according to the rates quoted in the last week's papers. Now, a schoolboy can give a good guess at how these two producers will stand in a few years. Other things being equal, one will be sure to make his way, in more senses than one; the other may come out right if he be lucky, and work hard enough with his hands to make up for his disadvantage in working uncertainly. Illustrations might be multiplied to show the value of good weighing apparatus as part of a farmer's outfit. In experimenting with different systems of feeding; in ascertaining the weight of grain per bushel; in knowing how many pounds a ton of fertilizer contains when bought from dealers—in a hundred ways, the implement will more than pay for itself in a few transactions. The fact that comparatively so few possess such an apparatus is a sufficient reason for introducing the subject to the Farmers' Club.

Col. Henry S. Olcott.—The Orange county farmers are not making more than seven per cent on capital invested.

Mr. Horace Greeley.—The trouble is they base their calculations on double what their farms are worth.

Dr. Hallock.—This is important; we want to get over the habit of guessing. If science is good for anything to ascertain the actual facts, we want it.

Prof. Nash.—In farming, every expense should be taken into account. We should consider that land is expensive, even when not in actual use. One farm may produce as much as another and all the while be going through the process of exhaustion, while another will be brought into an increased fertile condition, but be no more profitable.

Mr. Wm. S. Carpenter hoped the paper of Mr. Fitch would be published, as farmers often suffered frauds in the weight of grain, hay, beef, &c. He knew an instance of a man who weighed after seven millers, and found but one of them had just weights. He said a nominal ton of coals would, if driven on a good scale, often be found weighing no more than 1,700 pounds.

In this connection, Fairbanks & Co. exhibited Shaler's family scales. The weight is indicated by a finger moving on an index plate.

Mr. J. B. Lyman, to whom the subject had been specially referred, then read a

### REPORT ON VAPOR STOVES.

The committee to whom the vapor stoves—exhibited to the Club by C. M. Young, patentee—were referred for trial, submits the following report:

He has used one of them in his family for two weeks, and made a thorough test of its capabilities as a family cooking stove. The principle upon which the invention rests may be briefly described as follows: When petroleum is clarified or distilled, the first running is a light, colorless fluid, which emits a rank smell and is highly inflammable. If burned with a wick, like kerosene, it smokes badly and is offensive. The inventor of this stove, after a great number of experiments, has ascertained that by the application of heat to a tube filled with this fluid it may be converted into gas; and when this gas is properly combined with the vapor of water and with the common air, the mixture burns freely, gives out a strong and steady heat, but no smoke, gas or odor of any kind. This discovery once made, the mind of the inventor was turned upon the problem of making this apparatus so simple, so cheap, and so safe, as to cause the vapor stove to be a necessary part of the furniture of every well-appointed kitchen. A can containing two gallons of the gasoline, or naptha, is fastened at the height of six feet from the floor, and removed by quite an interval from the stove. A tube conducts the fluid down horizontally to the burner, its end curving under like a fish-hook, so that the burner comes directly under the tube about a foot from the end. Now, if the faucet is turned so as to let the fluid on, the hydraulic pressure will force a small jet from the orifice of the burner and throw it directly upon the tube above. Within this tube is inserted a fine coil of copper wire, which presents to the gasoline a large heating surface. Ignite this little jet of fluid and the heat in the tube which contains the coil of wire will soon be very great, so as to convert the naptha from a fluid into a gas. The pressure of the fluid in the tube and can renders it impossible for the gas to escape through the can. It must pass out at the orifice of the burner. Now, beneath the burner place a small vessel of water, so near as to be kept hot by it. The vapor rising from this water mixes with the gas from the burner, and both are blended with common air. The heat thus generated is steady, intense, uniform, easily regulated, and its degree and application wholly under control.

As to safety, the referee would say, that after careful investigation and experiment, he considers it is no more dangerous than the burning fluids in common use throughout the community. There are but two points where the flame can communicate with the naptha, one at the extremity of the burner—the orific in which is not much larger than a pin point—the other at the opening of the can where the fluid is poured in; but, as this orifice is guarded by a piece of perforated tin, after the manner of Sir Humphrey Davy's safety lamp, no danger from that source is possible; and, as these stoves require no chimney, and have no ashes or kindling wood about them, we deem them safer than the ordinary cooking stove. It is true there is an inflammable gas that rises in the can, and will light at the top or mouth piece; but it is impossible that this flame, if it should by any accident catch in the gas at the orifice, should communicate to the fluid below, for the perforated tin effectually prevents this. The observance of two plain rules will anticipate accidents and make them well-nigh impossible. 1st. The can ought to be filled by daylight and when the stove is not burning. 2d. The barrel of naptha should be kept out of doors in the yard, or in some out-house, and should not be approached with a lighted candle.

As to cheapness, this fluid costs eighteen cents a gallon. One gallon will run three burners seven hours at full blast, but as the cooking will frequently require a diminution of heat, and not the full intensity, a gallon may be made to last ten hours, and yet all culinary process go on. Breakfast for a family of the average size may be prepared in from twenty to forty minutes. The burners need not be lighted till the cooking is to commence, and may be extinguished the moment it is finished, so there need be no waste of fuel. The cost of the fluid consumed in preparing an ordinary breakfast will thus be seen to be less than two cents.

In effectiveness these stoves are surpassed by none. All the heat of the flame seems to be absorbed by the dish above it, in such a manner as to cook it quickly and thoroughly, but not to burn it. The various processes of washing, ironing, baking and boiling can, therefore, be performed on this stove with great ease and rapidity, and, so far as baking and boiling is concerned, in a more perfect and satisfactory manner than by the ordinary cooking stove. No time is consumed in preparing kindling wood or in cleaning the stove for use. The fluid must be poured into the can, which occupies three or four minutes, and the stove is in working order for the day. Coffee may be made in ten minutes, steak broiled elegantly in seven, potatoes baked in twenty, and bread in forty minutes, from the time the burners are lighted. As a summer stove this is especially excellent. It heats a room very little, and as it does its work so quickly and may be so easily extinguished, no unnecessary heat is made in the kitchen. As to neatness, nothing can excel it. Without smoke, ashes, dust, or anything of the kind, it is the *ne plus ultra* of cleanliness, and may be used in a parlor without fear of soiling the finest carpet.

Another recommendation of this apparatus is its movability. It can be carried as easily as a table, and the heat applied in a parlor, in an out-house, out of doors, anywhere. On the whole, the referee cannot but regard this invention as the most important of any that has been given to households since the late Elias Howe earned the perpetual gratitude of womankind by giving them the sewing machine.

J. B. LYMAN.

Prof. S. D. Tilman said the invention of Mr. Young was not entirely novel. He had succeeded better than any other person in getting complete combustion. Yet he thought some ill consequence might come of using the stove in a tight room. It must throw some products of combustion into the room, as carbonic acid, and maybe a little carbonic oxide in some cases. At any rate, it would be safe to make arrangements for full ventilation of such rooms. He thought the arrangement a safe one.

The report was accepted.

### DR. GRANT'S TRENCH PLOWS.

Several of the plows were exhibited by Mr. Brown, of the Peekskill manufactory.

Mr. Horace Greeley.—Having heard that Dr. Grant had invented a new plow, I went up to see it work. He has several kinds—some for common work, and others for deep plowing, and in rough ground. I consider deep plowing a remedy for the woes of this country. The large plows are drawn by two yoke of oxen, which I think are not enough. The soil, where the trial took place, is some ten inches deep of mold, and the rest gravel stones, up to the size of a lap-stone. Twice going through, so thoroughly mixed the earth, that one could not tell whether the mold was more in one place than in another. I never saw any trenching done better. No garden or orchard ought to be planted unless trenched two feet deep, so that the roots can penetrate to the moisture. Two feet is not deep enough, but I am so modest I stop here. I believe if our orchards were planted on such grounds they would never fail. The Belgians, who are the best farmers in the world, have come to the conclusion that ground should be stirred at least three feet deep. With such a plow as this, four yoke of oxen, two men and a boy, half an acre can be trenched per day; and being properly fertilized, double production will be insured. I do not believe that any other plow in the country will work the soil so thoroughy and to such a depth as this plow of Dr. Grant's.

Mr. Brown then read an interesting account of the manner in which Dr. Grant had modeled the plows, and he gave a full and interesting description of their construction:

*Contrivances for deep plowing.*—To the old plow manufactory at Peekskill many letters have come during the past six or seven years, asking for deep-working plows. Among twelve hundred different sorts and sizes, we had none that would plow more than twelve inches deep, though some contained nearly as much superficies as the plows now exhibited, but they were expensive, and trimmed furrows from one-third to one-half wider than the thickness of the slice. No plows in this country had been made that would run any deeper than ours. With the exception of the Jersey plow, which plowed but little if any deeper, and with greater draft than our large plows, no deep working plows had been made in foreign countries. The subsoil raised a little space, and dropped unmixed back again by the second passage of a wide turning plow, or of a common subsoil plow, was the extent of "tickling" to which the earth was liable from any existing plow. About a year ago, Dr. C. W. Grant came to us, saying that he had a burden on his mind of a duty to be performed for more than thirty years; that he dreaded to undertake it, but that if he should not succeed in doing it in 1867, he did not think that he would ever be able to do it. When we looked into his plans and at his grey hairs and infirm health, we thought so, too, and we gave him all the facilities that we could for fixing his ideas in wood and iron. We could not make his Delaware grapes grow large, but we made his beans grow great and strong. The peculiarity of these plows consist in the narrow waist, or inclined plane between the point of the share and the commencement of the lines that give the turning motion to the furrow slice. The doctor searched among all our different shapes of mould and the accumulation of forty years of incessant pattern-making share, and took many row-boat loads of plows to his island for study and trial. He finally selected the short, stout, sheep-stubbed plow, known among the democratic tillers of the rocky soil of Putnam county, and other similar places, as two and a half D, in its original shape, as made with a wooden beam, as the base of his deep-working plows. This two and a half D is scarcely ever used to turn a thickness of more than five inches. This plow, after making slight alterations, he stretched out between the point of the share and the base of the wing, and added to the top of the wing till it became "Iona Transformed," deep-worker. The office of this plow is to follow the furrow made by its prototype, or any other turning plow that will make a furrow of at least nine inches in width, and will raise from the bottom a subsoil slice, and without placing it upon the top of the preceding slice, will disintegrate it and thoroughly comminute it, grinding it as it raises it against the previous furrow slice, and mixing it with the fertile soil to the entire depth of the track of the point of the share. This process is varied by the addition of accessory pieces on the side of the mold, which adapt it for putting more or less soil at the bottom, and more or less subsoil at the top, as may be desired.

This plow performs the operation of half trenching, which is a thorough mixing, in a trench of moderate depth, the soil and subsoil and fertilizers, and is a perfect plow in itself for this purpose, to the depth of anything less than eighteen inches. In addition to being preparatory, this plow is also supplementary to the use of the great trench plow, as it contains the thorough mixing properties which are the chief glory of spade husbandry. This transformed plow is probably the one that will be mostly bought at first, as the agriculturist goes slowly down to the point of thorough trenching. Then he will want the great trench plow. This plow has the same narrow waist, but longer and has more curve to the upper or posterior part of the mold board, which turns the furrow and carries it laterally and places it over and upon the previous slice. This great trench plow mold board the doctor shaped in plaster with the experience of a farmer and the careful study of a sculptor. It is a beautiful thing to my eyes in the easy lines with which it gently persuades the furrow slice to rise up, turn upside down and roll over and upon its predecessor. This great trench plow has been used at my home and it plowed a trench thirty-one inches, and in one place three feet deep from top on the land side to the bottom of the trench, leaving it quite clean, and laid the furrow firmly on its predecessor. The average depth was twenty-two inches, it being a strong piece of ground, and the draft was not excessive for two stout pairs of oxen, being from nine hundred to one thousand five hundred pounds. I should say that three yoke of well trained cattle are all that will be required to send the largest of these plows to the extreme depth of twenty-four inches, even in quite stony ground. They are also made with accessories that fit them for more or less friable and loose soils. These trench plows may, and doubtless will be, made adapted to the strength of one pair of cattle on light soils, working perfectly to the depth of eight to fourteen inches. Their office is thorough trenching, which is where the subsoil is brought up in mass and the fertile soil is thrown down in mass, the position of the two different strata being reversed with the unfertile portion at the surface, to be brought into fertility by enrichment and amendment. Trenching is generally deeper than half-trenching, but not necessarily so. These trench plows are heavier than they need to be, for the curves are easy, the friction is at the minimum, and the furrow slice moves into the appointed position with very little disturbance. The beams are made of good Yorktown oak, both tough and stiff, with all the imperfections carefully covered up with paint. I don't know that any of these gentlemen, with the exception of Mr. Greeley and a few who have spoken and written, ever want to plow any deeper than my Putnam county neighbors, with the original two and a half D, and its five-inch slice; but if you do, all that I need to say is, that the plows are made at the Peekskill Plow Works, Peekskill, N. Y., a factory founded by the worthy Truman Minor, in the year 1826, who nearly forty years ago whittled his ideas about plows into patterns that have been more used and copied, and are to-day more in use, than any plows in the world. Upon application, a price list, and any other information in connection with the plows, will be furnished. At any rate, you need not hesitate hereafter to form any system of deep working through fear of the great cost of the operation, which was inherent to the use of the spade, and therefore unavoidable, as that implement was the immediate ancestor of the Iona deep-working plows.

At the conclusion of the paper, Mr. A. S. Fuller said, by way of illustrating the good effects of trenching, he wished to show two raspberry plants of the same age and variety. One had been grown in a trenched soil, the other not; the roots of the former were three or four times as large as those of the latter. He said he did not think the roots always plunge deeper in a soft soil, but they do grow larger, produce larger plants and better fruit and more of it.

Mr. Horace Greeley.—I differ with Mr. Fuller. The roots will go down for moisture if they cannot get it on the surface. In California, after the second year, vines stand the drouth, because by that time the roots are where the moisture is.

Mr. Wm. S. Carpenter.—I believe in deep plowing, but do not believe in burying manure so deep that the effect of the sun will not be felt.

Mr. Wm. Lawton thought that there is enough moisture in the atmosphere.

Mr. Horace Greeley.—In California I have seen one thousand trees a foot through which died in one year from drouth. Will anybody tell me that there is enough moisture in the atmosphere? In Illinois the river-bottom soil is sixteen feet deep, and I never heard anybody complain because the soil was too deep under their crops, or that the soil was too rich. Every one West will tell us that the deeper and more mellow the soil the better the crops. There is a great deal of soil in the world that had better not be cultivated at all, and be devoted to growing fruit trees, but wherever the soil is worth plowing at all, it should be well done. The mayor of Maidstone, England, told me that where the trees of an orchard had been dug up and the top soil put a foot below the surface, he had produced three times the amount of pears he otherwise would have raised, for they kept on growing long after others had stopped.

Mr. Williams.—In Western New York deep plowing has been limited, from the want of proper plows, and I am glad to see these exhibited here to-day.

Mr. J. B. Lyman.—I regard this question as the most important ever brought before this Club, for good plowing is the foundation of all agriculture.

Mr. J. B. Lyman offered the following resolution, which passed unanimously:

*Resolved*, That the Farmer's Club thank Mr. Greeley and Mr. Brown for the exhibition made to-day of contrivances for deep tillage. We commend this subject to the whole farming community as being of the first importance to successful agriculture.

### POTASH FOR POTATOES.

Mr. P. M. Barrow, Rington, Pa.,—I have bought two hundred pounds of crude potash for raising potatoes, in place of wood ashes, but have just read that alkali-wash from straw-paper manufactories will kill some growing crops.

Mr. Wm. S. Carpenter.—Mix about a pound of potash with five bushels of muck; it contains moisture enough to dissolve the potash.

Mr. Horace Greeley.—I would say two pounds to five bushels of muck. I have used two tons and find no trouble in getting the potash to dissolve.

Mr. R. H. Williams.—It will take three gallons of water to dissolve a pound of potash.

Mr. A. S. Fuller.—I have used potash—one pound to four quarts of water, on thousands of trees, for twenty years with success. This was on the rough bark, but a solution so strong as this will kill tender plants and branches.

### UPLAND CRANBERRIES.

Mr. A. J. Hines, Hempstead, L. I., stated he wished the Club would send some one out to see this fruit, and it would be shown that it is a distinct variety. Mr. Carpenter said it had been before the Institute and received a premium.

### LETTER FROM MR. BERGH.

A letter from Mr. Henry Bergh, in reply to the resolutions passed by the Club, was read by the Chair. He expressed his gratitude that the Club sympathized with him in his benevolent work.

### MANAGEMENT OF SUGAR MAPLES.

Mr. J. Gates Bingham, Solon, N. Y.—There are extensive maple groves in this county, which are great sources of profit to the owners. After the sugar season is over, we stop the bit holes, made with five-eighth augers, with pine plugs, which are easily made, and when gathering the spiles we drive in each one of these pins, and within three years or less the tree will grow entirely over the holes, preserving the vitality of the tree. I have often seen trees dead six inches above and below, when, had they been carefully stopped, they would have grown over, and in a great measure been saved.

### APPLE-TREE BORERS.

Mr. W. S. Ruckel, of Carroll county, Mo., asks what to do to kill the borer.

Mr. Horace Greeley.—There are two ways; either to look for his hole and draw him out with a little wire, or to plug him in so that he can get no air.

Mr. Wm. A. Fitch.—Wash the trunks of the trees, about the time the borer lays his eggs, with cresalic soapsuds. The odor will kill them.

Mr. Wm. C. Carpenter.—Wash the trees with a solution of potash, made by dissolving one pound of potash in two gallons of water, applied in the latter part of May or early in June, when the eggs are laid.

Mr. C. O. Read, Perth Amboy, N. J., said he had used the following remedy and found it effectual: Dig away the earth from the trunk of the tree, just where it enters the ground, and wrap around the soft bark thus exposed a sheet of tarred roofing paper. It should extend about a foot up the tree, and be lashed securely with twine. Throw the earth back as before.

Mr. A. S. Fuller.—I have tried this remedy with entire success. It is the best I know of. The borer cannot make his way into the firm bark of the upper part of the trunk, but seeks the softer places near the earth. If these are shielded in midsummer, when the pest does its mischief, the tree and its fruit will not suffer any for that year.

Mr. N. C. Meeker.—Rich ground makes thrifty trees; keep them clean and he will have but little need of wire-pulling or soft soap. Still, the trees need washing with strong soapsuds to destroy the eggs of insects.

### FITCHE'S PATENT FENCE-POST DRIVER.

A contrivance was displayed for driving fence-posts at regular intervals, and with great rapidity. It is similar to a pile driver. It costs twenty dollars, and with a horse, a man and a boy does the work of ten laborers.

### STUMP MACHINE.

The Empire stump-pulling machine was exhibited, and referred to the committee which was appointed to report on Pressy's patent, with instructions to prepare, if practicable, a comparative estimate of the cost and effectiveness of the two machines.

Adjourned.

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## April 7, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### THE CODDLING MOTH.

An insect that ruins millions of dollars' worth of fruit annually, by stinging little apples and pears on the bloom end, so that they fall or become nearly worthless.

Dr. Isaac P. Trimble expressed his views at some length. He thinks they can be exterminated by putting a band of hay around the tree. The moth resorts to this as a nest, and makes its cocoon beneath it. If a rope of hay is tied around the apple or pear tree, about the first of July, this moth will lodge its cocoons beneath it, and they can easily be destroyed.

Mr. Wm. S. Carpenter thought this moth could be killed by setting in the orchards lamps of kerosene oil, or tubs of soap suds, or by open-mouthed bottles filled with sweetened water.

Dr. Isaac P. Trimble expressed his conviction that lamps and bottles of sweetened water killed a great many moths that are friendly to man; as many as it does of the enemies of fruit. He said the coddling moth is not active as a moth till about the end of June.

In this connection, Mr. G. Jaques, of Boston, was introduced. He is the inventor of tobacco soap, which has been found, by several horticulturists in Massachusetts, effective in clearing plants of lice, red spiders and rose bugs, and also for driving vermin from animals. The Chair appointed several gentlemen as a committee of reference, to use it and report results.

### DEEP PLOWING.

Mr. S. Edwards Todd.—Mr. Chairman, we have had trite maxims handed down to us, from time immemorial, in which deep plowing has been advocated; and the subject of plowing deep at all times and in all places, was like a chain through all our agricultural literature. We are all zealous advocates of deep tillage. I believe in putting on a strong, heavy, double, and sometimes treble, team, and thrusting in the plow beam-deep, even when the implement is constructed with a direct reference to thorough pulverization, to the depth of thirty or forty inches, provided the soil is of such a character as to require such deep tillage. I say to one man, put in your plow beam-deep, and turn up a new soil that will yield a more bountiful crop than was ever before seen on that land. But to another farmer, I say, do not plow that land at all. It would be ruinous to plow it. There are thousands of acres of excellent land in New Jersey and other States, that should never be disturbed either with the trench-plow, the surface-soil plow, or the subsoil plow. I have a small farm, which I am now cultivating, that I would not have plowed with either of the implements just alluded to, for the price of half the value of the land, even if plowmen, teams and implements were furnished gratuitously; because deep and thorough tillage would operate most disastrously on the productiveness of that soil.

I am aware that these suggestions will operate like a bombshell among the advocates of deep plowing. But allow me to explain this apparent duplicity on the subject of deep plowing, by stating when to plow deep, when not to plow deep, and how to plow deep. Will the advocates of deep plowing charge me with lunacy when I tell them that the accustomed productiveness of some of the finest farms in Central New York received a death blow for half a dozen successive years, simply by being plowed deep, in a wrong manner, or with an implement that did not pulverize the soil according to the requirements of that particular geological formation of the soil and the subsoil? The peculiar manner of plowing certain soils deep makes all the difference imaginable in their productiveness. On the contrary, you may plow other soils with a trench plow, with a Michigan sod and subsoil plow, with a surface-soil plow, followed by a subsoiler, and the more you plow, and the deeper the implements are driven into the fertile land, the more bountiful will be the crops.

We will take, if you please, the "deep tiller" plows of Dr. Grant's patterns, that were before the Club a week ago, which are constructed to run from twenty to thirty inches in depth, bringing up the earth from two or more feet below the surface, and laying it out to the combined influences of refreshing showers and sunshine. The geological formation of the surface of the earth, in that particular locality, is such, that the deeper the plow is driven, the more thorough the pulverization of the soil is, the heavier the crops will be. We all understand that; and our views all coincide most perfectly. All we need on such land is to keep plowing and return a fair equivalent to the soil for the crops that have been removed, and seed time and bountiful harvests will never cease. Now, let us go with our big team and huge plow that has turned the fertile mold into bright shining gold, to the slopes of the lakes in New York, or to plowing the heavy soil in Ohio, Canada, or in many other localities, where there is only a thin stratum of mold resting on the surface of a cold, unfertile, heavy, compact, and uncongenial substratum. The elements have been in operation on such land certainly since the period of the Noachin deluge—transforming little by little particles of this stubborn stratum into a seed bed adapted to the requirements of growing plants. Ages and ages have rolled away while that thin stratum of humus, or fine vegetable mold has been forming. This fine mold is one of the fundamental requirements of a fertile soil. No plant can grow satisfactorily and mature perfectly, without access to a bed of such fine mold. And growing plants require the full benefit of the mold when they first begin to grow, far more than at any other stage of their growth. From this fact we can conceive why a stratum of fine, fertile mold should always cover the surface of the land. When the tiny seed sends forth its tender roots, and pushes up its stem, it requires all the advantages of a mellow, fertile seed bed, filled with carbonaceous material that is in a condition to promote vegetable growth. The young plants need to be started in the most congenial soil. After the roots become strong, they can strike down into the substratum, that is less fertile than the mellow seed bed that nature has prepared on the surface of the land. Now, then, suppose we thrust in the deep tiller plows, and turn the thin stratum of mold one or two feet beneath the surface, and bring to the surface a layer of heavy, unfertile earth, that must be exposed to the influence of the elements an age, or more, before it will be in a proper condition to supply the requirements of growing plants? Who does not perceive, at a glance, that no system of husbandry would be more ruinous to the productiveness of that soil than deep plowing according to the manner alluded to?

How to plow deep, then, recurs again with increased interest? I answer, such soil should be plowed—not with a trench plow, but with a common plow, that will simply run as deep as the mold extends—and this surface plowing should be followed by a regular subsoil implement, that will break up and pulverize in a most thorough manner the compact substratum, and leave it beneath the thin layer of mold on the surface The oftener the subsoil plow can be run in such ground, and the deeper it can be driven, and the more thorough and perfect the substratum can be comminuted, the larger will be the productive capacity of the land for raising cereal grain, grass, vegetables, or any kind of fruit. The grand end and aim should be to keep the humus, the vegetable mold, when there is but a thin layer of it, on the surface. Suppose a farmer, in his commendable ambition to produce a herd of beautiful cattle, well developed and symmetrical in every respect, should cover his pails of milk with a layer of hay, then spread a thick course of straw over that hay, and say to the young calves, that cannot be reared satisfactorily without milk, eat your way through the course of straw, and keep on eating through the hay, till you can reach the pails of milk. Who would not exclaim, "What a palpable absurdity!" Precisely so it is with some kinds of deep plowing. When all the mold is turned under deep, the young plants are required to force their way through the straw and the hay to the nourishing pabulum which should have been kept on the surface. If a soil that is poor in humus, or vegetable matter, be plowed deep, by turning the stratum of mold a foot or more beneath the subsoil, an immense quantity of vegetable matter must be added, and must be thoroughly mingled with the soil before that land can be brought to its accustomed state of productiveness. Deep plowing, however thorough and complete it may be performed, can never impart fertility to the land that is sadly deficient in the elements of productiveness. On the contrary, if the elements of fertility are locked up mechanically in the soil, the plow will render material aid in making that fertility available to the roots of growing plants. Touching the soil alluded to, that should never be plowed; it is sufficient to state that when the surface soil and the entire subsoil are so mellow and porous that the roots of grass, grain and trees will meet with little resistance when spreading through the upper and under stratum, the most economical, profitable and scientific mode of tilling such ground is to scarify the surface with a wheat cultivator, that may be run from two to six inches deep. By this manner of cultivation, the best part of the seed bed is prepared on the surface. If there is any mellow soil or rich earth, and it is in limited supply, every farmer and gardener who understands the laws of vegetable physiology, will say at once that it should be on the surface. Then, let the process of fertilization and thorough pulverization be pushed downwards as fast as the land can be changed into a mellow and fertile seed bed. Were some land plowed deep, by turning up the substratum, vegetable matter and coarse manure would be required, equal to five or even ten times the cash value of the land. To carry out a system of deep plowing, as is sometimes recommended, in all places, would be attended with the most unsatisfactory results, and would tend to bring deep plowing into utter contempt. Let me make a single suggestion, which will apply to all kinds of soil, and which will always be a reliable guide in plowing or spading deep. It is this: Keep the most fertile stratum of earth at the surface. If the ground two feet beneath the surface is richer than the super-stratum, turn up a new layer to the top. But, if available fertility diminishes as you go down from the surface, let the subsoil plow be employed to follow the common plow, and thus plow deep, and at the same time operate with nature in keeping the soil right side up.

Mr. Wm. Lawton, in moving the publication of Mr. Todd's paper, said he was glad such a statement had been prepared by a practical farmer; that mischief might ensue, if the Club should indorse, without any qualification, the views advanced last week by one who brings to the advocacy of any theory the weight of a great name.

Mr. Wm. S. Carpenter.—I am glad that Mr. Todd has read this paper, for it would do much damage to have it go out from this Club, that deep plowing is good, regardless of the soil's fertility.

Mr. A. S. Fuller.—I am on a poor sandy soil, and still plow deep. I turn the surface soil to the bottom for a basis to manure on, and I intend to manure all the way from top to bottom.

Mr. P. T. Quinn.—I have farmed in New Jersey for seventeen years, and never knew an acre of land, however poor, hurt by deep plowing. To be sure, putting the surface too deep down, will cause the next year's corn crop to look yellow. Deep plowing should be done gradually, and the soil kept up with manure.

Hon. George Geddes, of Western New York, then said, that on the soil of his part of the State, the best farmers were those who plowed the deepest. Below the mold they have a hard clay, made of disintegrated shale, and every year the best cultivators are going a little deeper, and bringing up an inch or two of that subsoil, and mixing it with the old mold, and the farms increase in fertility. He thinks clover the best of all crops on such newly upturned earth. He has a field at a distance from his barns, where wheat was raised in 1790, and last year it grew twenty-four bushels per acre; the year previous, twenty-five bushels. He does nothing to it, but now and then turn under a crop of clover.

Dr. Grant, of Iona, the inventor of the deep plows exhibited last week, said he did not suppose farmers would or should turn up all fields to the depth of two or three feet. Judgment must, of course, be used in this as in other operations of the farm. But in France the rule as to deep plowing is, that one should make a seed bed from sixteen to twenty-four inches in depth. At some time he proposes to submit to the Club an essay on this subject, showing where and when to plow deep.

### REPORT ON STUMP-PULLING MACHINES.

The undersigned committee submit their report, as follows: The Empire machine, exhibited before the Club at a recent meeting, by the manufacturers, English & Johnson, of Corning, N. Y., was tested last Saturday on the premises of Mr. George W. Esten, at Boonton, N. J. The implement used was purchased a year ago, and since that time has been employed in removing the stumps from five acres of new land. Mr. Esten informed the committee that it had never failed to do its work well, and that it had saved its owners a thousand dollars during the past six months. The stumps were extracted from very stony, hard, gravelly soil, and measured from one to three feet in diameter. At the trial the committee saw a green chestnut stump lifted in about three minutes; it took up earth weighing at least fifteen tons, and which could not have been dug out by hand for less than six dollars. Further satisfactory exhibition was given, and the committee were convinced that the "Empire" merits all the praise bestowed by those who have used it. It is simple in construction, adjusts itself to uneven surfaces, is durable, and easily operated with one or two horses, or a pair of oxen, or by hand power, if the stumps are comparatively small. Its lightness insures ease of transportation, and its cost is much less than that of most machines which claim to accomplish a like amount of labor. The committee are unanimous in recommending it as the best stump-puller for general use, which has been brought to their notice.

The same committee, on Wednesday last, April 1, witnessed a trial of Pressy's stump-puller, at Bricksburg. We saw it pull stumps, eight inches and under in diameter, at the rate of ten an hour. Considering its cheapness, portability, and the ease with which it is put up, and that all the iron parts of it are made of wrought iron, and can be repaired by any blacksmith, we recommend it as one of the best machines for sandy and light-timbered sections. All of which is submitted.

J. B. LYMAN,
S. E. TODD,
J. A. NASH,
A. B. CRANDELL,
RALPH MEEKER.

### SUBSTITUTE FOR WALL PAPER.

Mr. Davenport, New York, exhibited specimens of this material, which attracted considerable attention. It is simply very thin wood veneer, but manufactured in an entirely new manner, and treated with glycerine, so as to render splitting or checking impossible. It is cut so that any desired styles of grain may be had, such as bird's-eye maple, black walnut, oak, chestnut, ash, mahogany, and rose-wood; in fact, it can be made from any kind of wood. It is claimed that the veneer is cheap and can be easily put on plaster, and looks exactly like a wall of solid wood. When varnished, it is said to look far better than the most beautiful graining, however well it may be executed. Two hundred thicknesses to the inch can be cut. A committee was appointed to examine and report.

### FAIRCHILD'S METALLIC BAG HOLDER.

This invention is a metallic rim, which may be attached to its stand or to the side of the barn; when on the stand it is portable and can be set upon a scale if grain is to be weighed. The sack is fastened by steel hooks to the sides of the rim or mouth.

The Chair.—This is simple and will be a great saving for farmers.

### THE FALLING OFF IN WHEAT.

Mr. John Disturnell read a short statistical paper on the importance of agricultural education as illustrated by the alarming decline in the wheat crop:

Agricultural education, in the New World, is of the most vital importance to the whole human race, as our present virgin soil, if aided by scientific research, can be made to yield a surplus of food so as to prevent famine in this as well as the Old World. Contrast the modes of field agriculture of the present day, as pursued in most parts of Europe, with those of this favored country, and you will find, with all our boasted improvements in agricultural implements, the European agriculturist generally produces much the largest yield of the cereals, such as wheat, rye, oats and barley. This fact is accounted for by the English, French, and German agriculturist bestowing more labor and fertilizers to their land, thereby keeping up its original productiveness; while here waste, idleness, and a superficial culture is sure, sooner or later, to destroy the best soil that nature in her bounty has produced. Such is the virgin soils of our Western prairies. I will only refer you to the startling facts which are published by the State Agricultural Society of Ohio, during the past sixteen years, to establish the truth of these assertions.

The wheat crop of Ohio, during a period of sixteen years, has been as follows:

| YEARS. | Acres. | Bushels. | Average per acre. |
|---|---|---|---|
| 1850 | 1,742,000 | 31,500,000 | 18.0 |
| 1851 | 1,657,257 | 25,309,225 | 15.2 |
| 1852 | 1,631,151 | 23,043,737 | 14.1 |
| 1853 | 1,421,826 | 17,118,311 | 12.0 |
| 1854 | 1,475,935 | 11,889,110 | 8.0 |
| 1855 | 1,407,773 | 19,569,320 | 13.8 |
| 1856 | 1,478,174 | 15,333,837 | 20.2 |
| 1857 | 1,800,000 | 25,397,614 | 14.0 |
| 1858 | 1,695,412 | 17,655,483 | 10.4 |
| 1859 | 1,780,543 | 13,347,967 | 7.3 |
| 1860 | 1,844,667 | 23,640,356 | 13.0 |
| 1861 | 1,934,000 | 20,055,424 | 10.5 |
| 1862 | 2,401,535 | 29,916,518 | 12.0 |
| 1863 | 1,811,278 | 20,452,410 | 11.5 |
| 1864 | 1,665,495 | 15,541,385 | 9.3 |
| 1865 | 1,451,720 | 13,234,139 | 9.0 |

Many trustworthy gentlemen informed me, that in a township which formerly averaged twenty-five bushels of wheat per acre, during the last ten years, did not produce more than an average of five bushels. This falling off in one of the staple products of Ohio is owing to the want of proper knowledge of the principles of farming which every intelligent farmer ought to possess; and to what does this negligent course lead? It results in the converting of the soil, that might be profitably cultivated, into a barren waste. This fatal result is becoming visible in the Western and Southern States of the Union.

### PEACH ORCHARDS.

Mr. James L. Wadsworth, Windham, Ohio.—How far apart should peach trees be set for profitable cultivation?

Dr. Isaac P. Trimble.—In the West they ought to be planted about twenty-five feet apart, and in the East sixteen feet.

Mr. N. C. Meeker.—Eighteen by twenty feet is about the proper distance. Plant your trees out early in the spring; keep them well cultivated and headed back; be sure to cut the bores out twice a year, and if your land is rich you will have no trouble in growing fine peaches.

### HEADS FOR PORK AND PICKLE BARRELS.

Mr. John Burgum, Concord, N. H., exhibited an improvement in the heads of pork or pickle barrels. This was highly commended.

Spikes are forced out by a knob, when they attach themselves to the sides of the barrel, holding the head at any desired point.

### NEW BAG FASTENER.

Mr. J. S. Davis, Laport, Ind., sends us the above article, which is simply a long narrow buckle, with a flat tongue, having a slat for catching upon the card. A smaller size is for shoes, and either can be applied to a great variety of objects. If it could be made very cheap, it would come into general use. Adjourned.

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## April 14, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### CONCRETE HOUSES.

Mr. Robert S. Innes, Burlington, N. J.—Concrete houses are cheaper than those built of timber at fifteen dollars per thousand, or bricks at five dollars per thousand, for a handy man can do all the work himself. The washing down of the walls before drying has been the great objection to building concrete houses.

Mr. Bertholet, Manchester, N. J., said he had devoted much attention to the subject, and had for years been convinced that a concrete might be formed much cheaper than either brick or stone, and more lasting. But the conditions vary so widely, the sand of different localities being unlike, the lime of various degrees of purity, and the distance from which materials must be hauled, that no general rule can be indicated. In short, it depends on circumstances whether a concrete wall is any cheaper or more durable than brick or stone.

The Chairman.—Some years since a physician in Hartford determined to build concrete walls for his dwelling-house. He sent to Portland and bought the dust and chips from the freestone quarries. The house cost him $8,000, $3,000 more than his calculation, and he found that he had saved nothing by using concrete.

Mr. Geo. Geddes.—In Western New York we have found that the success of concrete buildings depends on the foundation and the quality of the lime or cement used. If they are both good, the concrete wall will be strong and durable. We have, as yet, but an inadequate knowledge of the best way of mixing mortars. We think the quicklime should be very pure, but it often occurs that the strength and permanence of a mortar depends on the impurities of the lime.

Mr. H. B. Smith, of Westfield.—I have been devoting much attention to this subject, with a view of ascertaining the cheapest material for farm structures. At present I know of no concrete that can be made cheaper than a brick wall. With brick at ten or twelve dollars per thousand, and stone at the common prices, the farmer can do no better than to use them. In Milwaukee, and many Western towns, they are using, with great satisfaction, a combination of brick with the common lumber frame. This saves weatherboarding, and a lower grade of lumber can be used with brick. It is found about as cheap as the frame building, and superior to it.

Mr. S. Edwards Todd.—Mr. Innes thinks his plan is much cheaper because rough workmen can be used. He makes a two-sided box, as long as the height of his house, and fills it with concrete. These concrete sections are then set up side by side on the sill and fastened together. The outside and inside are then plastered, openings being left for windows and doors. I do not speak of his plan as recommending it, but simply as stating what he claims for it.

Mr. Deihl.—In traveling in the East, I observed in the ruins of Baalbec, and at Babylon and the Tower of Babel, specimens of concrete that must be over four thousand years old. They are as firm to-day as when first erected. This shows us that the composition of a first-class concrete is one of the lost arts. The ancients excelled us in this.

Mr. A. S. Fuller gave an instance of a concrete wall built for Delmonico, that fell down at the first hard frost, and the judgment of the Club is that no concrete walls can be recommended as equal in cheapness and durability to both the materials generally used.

### CEMENT WATER-PIPES.

Mr. S. M. Daboli.—About one bushel of cement to two of sand will make a strong pipe. The sand should be sharp and coarse and well washed. A good way to wash sand is to place the sieve box in a stream of running water, put the sand in this box, and stir it with a hoe. Mix the cement and sand thoroughly, in a dry box, before wetting. Wet a small quantity at a time, and clean out the box thoroughly before wetting a second box full, for small pieces left will partially harden in a short time, and if these are worked in they will injure the solidity of the pipe. In laying, take a scantling of the proper size, five or six feet long, round the upper surface and put a handle on the upper side; lay this in the bottom of the ditch, and put fine earth around it, and pound the earth down with a maul, thus making a smooth mold for the bottom of the pipe. Put the mortar into this mold from a trough of suitable size, the same length as the molding scantling; work a rod into this mortar, and then cover it with more mortar from a trough of smaller size, smoothing the top with a trowel. The rod should be in two pieces, joined by leather, in the shape of a hose, the forward piece to be a little longer than the molding scantling and the latter part a foot or more long. The rod should be drawn out as far as this leather joint, and then the forward part turned up out of the way. The latter part remains in the pipe until it is finished. At the end of the rod an egg-shaped piece of wood should be fastened, so that the bore of the pipe will be smooth.

Mr. George Geddes.—The great difficulty in putting down these pipes is to prevent their falling in when the dirt is put on. When once laid, they are cheap and everlasting. It takes about one bushel of cement to two of sand for each rod of pipe.

Mr. Lawrence Van Wyck.—If the cement contains any quick-lime, it will expand and fall to pieces in a few hours after it is set.

Mr. Fuller.—This is, probably, what was the matter with Delmonico's wall.

### FLAX CULTURE.

Mr. W. J. Perry, Centre White Creek, Washington county, N. Y.—Flax is a profitable crop, but requires a large amount of severe and dirty labor. In this part of the State, Irishmen do most of the work, and there are many of them who have become the owners of farms through its cultivation. I will try to give an idea of the process of producing it, wishing to be understood that no written description will answer the purpose of actual experience, that being the *sine qua non* of success. Flax is usually sown on corn hills any time from the middle of April to the same time in May, the ground being plowed and harrowed before sowing, and harrowed once afterward. The amount of seed sown is from twenty-eight to thirty-six quarts per acre. Plaster or wood ashes help its growth, if sown soon after it is out of the ground. No more attention is required till it is fit to pull; when it turns yellow, the bolls harden and the leaves wither, and it falls to the ground. It should be pulled before the stalk begins to harden or dry. Now, the hard work begins. An active man, if used to the business, can pull from one-fourth to one-third of an acre per day.

It is pulled in bundles, such as can be clasped with two hands, each handful being bound by a few spears of flax twisted around the same. It is then set up, the handsful two and two, six or eight in a shock. This costs from eight dollars to twelve dollar per acre. When thoroughly done, and the bolls are dry, the shocks are bound together with straw or flax, double banded, and placed under shelter. The seed is now beaten off, the usual process being to strike the seed on a large flat stone, set up at an angle of about forty-five degrees on the barn floor. A more expeditious mode is to crush the head of the bundle between two cylinders, running with a spring, each pair outside of a wooden frame, attached to a horse or water power. A common farming mill, with a flax-seed sieve, cleans the seed—the unbroken bolls falling under, they having to be threshed afterward.

The straw is then taken to a smooth meadow and spread evenly, first dropping the handsful a proper distance apart on the ground, and then, with jackknife in hand, cutting and spreading from one side of the field to the other, putting about three acres of flax on one acre of ground. When partially rotted, it is turned with poles, the same as one would turn a swath of grain. Sometimes, if the weather is warm, with frequent showers, it will rot in ten or twelve days; but it generally takes from four to six weeks. It is then taken up by hand and bound in bundles, of about the size of oat bundles. The cost of this, from the time of pulling, is from six dollars to ten dollars per acre. Here the farmers furnish part of the labor, the mill man doing the rest. During these labors there are many contingencies. I once lost a crop by frost just before it came out of the ground, the seed having sprouted. After it is fairly up, a common frost will not injure it.

Sometimes it will lodge down, and much of it spoil before it is fit to pull. Last year much of it was badly damaged at this time, soon after it was pulled, by hot, rainy weather causing the seed to grow and the straw to mold and rot. Still, I am of the opinion that it is about as sure a crop as corn.

Able farmers do not like to raise it, because its care consumes all the time between other crops, leaving none for improvements on farms. Much flax is sown on land hired at twenty-five dollars an acre, and you see that a crop of oats at present prices is quite as profitable to the owner, and does less injury to the soil. Flax will not grow successfully on soils exclusively clay, sand or gravel. On river bottoms, it lodges by reason of rapid growth. The same may be said of land that is highly manured, with the additional drawback of weeds. Herein lies the difficulty of pulling flax by machinery, as no machine will sort out the weeds, and green weeds in the bundle will spoil the fiber.

In this part of the State, where it has been raised for many years, it does not grow so well as formerly, which is conclusive evidence that it takes something from the soil that ordinary farming does not replace.

Mr. Alfred Young, Gustavus, Ohio, recommends the feeding of flax straw to cattle. I think that they would eat shavings quite as readily.

A good acre of flax will yield ten bushels of seed, which is now worth about $2.50 per bushel, and three hundred pounds of lint, which is worth fifteen cents per pound, making the total product of an acre $70. The cost of producing is, say $5 for getting in, $3 for seed, $10 for pulling, and $10 more for drawing in, whipping, spreading, taking up, and drawing to mill, and $15 more for dressing, making a total expense of $43 per acre, leaving a profit of about $27. There have been instances when as much as twenty bushels of seed have been produced from one acre, but this is rare. Five hundred pounds of lint is sometimes grown on the same space. Let no one attempt to grow this crop except where workmen are plentiful, for, when the time comes for harvesting it will brook no delay. All who raise it are in favor of much larger duties on the imported article than our legislators have ever seen fit to bestow.

### PRESERVING TIMBER.

Mr. Chas. S. Clarke, Harrisburg, Ohio, suggests that when settlers go into the wilderness they reserve belts of timber around their farms, and even across intended fields or boundaries; also, to spare beautiful groves and specimens, which he thinks would be a much better plan than to clear off all the timber, leaving to the next generation the alternative to plant or go without.

Mr. N. C. Meeker.—This plan of Mr. Clarke ought to receive the attention of all new settlers in timbered countries. There is a distinction, however, in timber. In Northern Ohio, Western New York, Western Pennsylvania, and in many parts of Michigan, where the timber grows very tall, close on the ground, and is straight-grained and brush, belts of timber survive but a few years, for they lose the protecting influences which surround them in the great forests. Many farmers, having left noble specimens, are mortified that they fall before the high winds. Nor are they so long-lived as has been supposed. It would seem, then, that the trees to be left should be of the smaller kind, and so thinned out that they can attain a spreading and stocky growth. In other parts of the country, where by reason of the soil the trees send down long top roots, and when their grain is tougher, the rule may vary. Still, as a general thing, it must be said that to keep up a supply of forest trees, we must resort to planting and preserving trees on rocky and hilly lands.

### THE CHEMICAL ACTION OF CERTAIN FERTILIZERS.

Prof. Horsford, of Cambridge, Mass.—The extraordinary crops that have been produced during the last few years by the use of superphosphate of lime on the Seekonk Commons, which, for many years previous, had scarcely produced moss, naturally led to the inquiry, "Where do these crops get their potassa?" The porosity of the soil, which permits the heaviest rains to be rapidly swallowed up and leached away, only embarrassed the inquiry. Soluble potassa, naturally present in the soil, could not long remain within the reach of the roots of plants, and yet, as the fertilizer does not contain potassa, and as by its use astonishing crops have been produced which require potassa, the ingredients could not only come from the soil; moreover, it must have been present in the soil in insoluble form until the fertilizer was introduced. Now, for the most part, the soil is drift sand, derived from the disintegrated rocks of New England. These are known to be mainly gneiss and sienite, composed of quartz, feldspar, mica and hornblende, with smaller proportions of other minerals and calcareous varieties. From these the crops must derive whatever nourishment is not drawn from the air or supplied by manures. From these, which, in a state of greater or less subdivision, exist in the soil of Seekonk Commons, enriched only by acid phosphate of lime, sulphate of lime, and sulphate of ammonia, crops must derive their potassa, and to some extent their magnesia. But how are they obtained? This was ascertained by practical experiment. Feldspar, which is a compound of silica, potassa and alumina, was pulverized and treated with acid phosphate of lime. The free phosphoric acid of the superphosphate of lime seized the potassa of the feldspar, disengaged it from the silica and alumina, and yielded soluble phosphate of potassa. This explained at once the source of the potassa, and explained too, in part certainly, why acid phosphate of lime is so much more effective and prompt a manure than ground bones. The latter depend mainly on the carbonic acid of rain water and decaying vegetation for their solution. A similar experiment with steatite showed the prompt action of the acid phosphate of lime on this magnesian mineral. The second quality is that of the action of sulphate of ammonia on the magnesian minerals in the soil. Mixed with powdered steatite and water, it rapidly disengages the magnesia, at the same time disengaging silica in a form for ready solution in the ammonia of rainfalls. The third quality, and one of the most important, is the action of the acid phosphate of lime in the reduction of crude organic matter to the required fineness for use in the growth of plants.

There has prevailed, for an indefinite period, an idea that vegetable life, evolving albumenoid bodies, must precede animal life; that the nerves, muscles, and integuments of animal life, of whatever grade, must be produced from the albumen elaborated in the plants. But Pasteur has shown that the lower orders of microscopic animal life develop their germs in water, containing only non-nitrogenous organic matter (tartrate of potassa), a salt of ammonia, and phosphates of the alkalies and alkaline earths. The inorganic ammonia furnished the nitrogen, as the inorganic phosphates supplied the other required mineral constituents of the animal tissues and complete organs. Animals then possess the power of elaborating albumenoid bodies containing nitrogen and the phosphates out of preëxisting materials in which the ingredients are found in separate states. This discovery prepared the way for the observation of Collas, that recently prepared (gelatinous) phosphate of lime added to animal matters greatly promotes their decay. The germs of microscopic life find the food for their growth in condition to be readily assimilated. They multiply and feast upon crude animal matter, which, passing through their organism, is resolved into the finest material food for plants. I have found that acid phosphate of lime possesses this quality of rapidly developing microscopic life in flesh in a most astonishing degree. I have also had the opportunity, during the past summer, to make an experiment, on a generous scale, with vegetable matter, to test the effects of this fertilizer on matter in compost. I mixed with half a ton or more of green grass a quantity of a superior quality of superphosphate, made by George F. Wilson, of the

Rumford Chemical Works, Providence, threw the whole into a cement-lined cistern, poured over a few pails of water, and covered carefully to exclude the air. Great heat was soon produced, and when this had subsided the whole mass was found, while still retaining in great degree the forms of grass, to be converted into myriads of microscopic forms of animal and vegetable life. Much of the vegetable matter had passed through the organism of this minute life. The acid phosphate of lime and the sulphate of ammonia, as well as the vegetable matter, were at hand to aid in the development of the organic germs. They had multiplied to an astonishing degree. On drenching a tuft of the disintegating grass, the water acquired a swarm of minute life, and the solution, on evaporation to dryness, yielded an extraordinary residue in obvious condition to meet the wants of nascent vegetation.

Thrifty vegetation requires that the plant food of the soil should be provided in solution. Extent of surface is a first requisite of substances to be dissolved. Ammoniated superphosphate of lime promotes the growth of the minute organisms which resolve the coarser organic matter of compost heaps or of soils into the finer and more soluble forms, from which they pass readily to solution and to the circulation of vegetation.

It should be borne in mind that the value of any fertilizer which may by analysis be shown to be rich in phosphoric acid, is not always in proportion to the quantity thus shown, because this acid, hough abundant, may exist, as is the case with ground bones and imperfectly made superphosphates of lime, of which there are many, and with most of the phosphatic guanos, in an insoluble state, requiring perhaps years to develop itself by decay. The ammonia also in such preparations may be abundant, but in a free state, as in Peruvian guano, and thus rapidly volatilize and be lost in the surrounding atmosphere.

Professor H. indicated his willingness to appear before the Club at another meeting, and say something on the chemical conditions of good bread-making. Considerable discussion followed as to the merits of fish cake or fish guano as a manure. Some said it makes sorrel come in. Others said any manure would make the sorrel grow in most soils, and that hoes and plows must be relied on to kill it, not the absence of rich manures. This fish manure is best applied in the compost heap.

Dr. Grant, of Iona, reverted to the subject discussed last week and the week before—

### DEEP CULTURE FOR GRAPES.

Dr. Grant, of Iona, read extracts from well-known French and German authors, to substantiate his theory regarding deep plowing. Victor Rondeau, commissioner of all the principal grape vineyards in France, says that in one department where there are over 300,000 vineyards, the rule is to trench to the depth of not less than thirty inches, and no one thinks the work well done, unless the soil is loosened twenty-four inches deep. The same method of cultivation is carried on in all the grand vineyards of France. In Corsica they trench as deep as forty-eight inches, and in Burgundy thirty-nine. The doctor quoted from Guizot, De Breil, Carriese, and other acknowledged authorities, who all agree on this question. The Club will devote a future meeting to this subject, when Dr. Grant will read a special paper on deep tillage.

Mr. Wm. S. Carpenter.—It is conceded throughout the world that where the soil is thin, yet rich enough for corn, the best grapes are produced. My authority is Marshall P. Wilder. Dr. Grant's remarks are interesting, yet I believe there is another side to this question.

### SILKEN-HAIRED ANIMALS.

Mr. Deihl, recently from Persia, showed some beautiful specimens of the wool or hair of the Angora goat, produced in this country, and brought before the Club a long-haired Persian cat that he has just imported. He said the animal is an excellent mouser, of affectionate disposition, and its skin of much value as a fur. He will soon read to the Club a paper on the farming and farm animals of Asia.

### DOOR FASTENER.

Mr. Hall, 208 Broadway, New York, showed a contrivance admirable for the purpose. A small but strong steel screw is inserted in the back of a common pocket-knife. The knife is screwed like a button into the post next the door and makes a strong fastening. Mr. Hall said his room was entered and his money stolen while he was traveling in Wisconsin, and he bethought him of this way of securing any door in a cheap and simple manner. It was highly commended.

### SHALER'S FAMILY SCALE.

Mr. A. Bushnell, No. 32 Courtlandt street, N. Y.—This scale is simple, accurate, and cheap. It embodies old principles newly applied, transforming the spring balance into a neat, portable counter scale, weighing from one ounce to twenty-five pounds. A prominent feature is that it can be instantly adjusted for any size scoop or pan, and will be useful in making cakes or preserves. The weight is indicated on a dial plate, as the hours and minutes are on a clock. The Club commend it. Adjourned.

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## April 21, 1868.

Mr. NATHAN C. ELY in the chair; Mr. JOHN W. CHAMBERS, Secretary.

### SETTING FENCE POSTS.

Mr. T. D. Austin, Waveland, Ind.—Twelve years ago I set some black walnut posts—a part top end up, and the rest top end down. In six years those set with the butt end down rotted off, while the others were sound.

Dr. Isaac P. Trimble thought that water can only run one way through timber.

Dr. J. V. C. Smith.—It is a well known fact that sap flows up or down, as is the case with cuttings.

Mr. A. S. Fuller differed with the writer, insisting that there is no reason why it makes any difference. Let some man prove it by trial and give us the result. That will benefit the farmers, but not theories.

### HATCHING CHICKENS BY ARTIFICIAL HEAT.

A correspondent asks if hatching chickens by artificial heat can be recommended.

The Chairman.—Why should we rob the hen of the pleasure of hatching her young? The proceeding is against nature.

Mr. Wm. S. Carpenter spoke in favor of it; said it had been tried and found practicable. There is no difficulty in hatching out the chickens; the trouble arises in taking care of them without the hen.

Mr. Simeon Baldwin, New Haven, Conn.—He had a hen that sickened and died while setting. He put the eggs in a woolen bag and kept them near the fire till the chicks appeared. They were raised without difficulty.

Dr. J. V. C. Smith said that in Egypt the practice of hatching chickens from eggs by artificial heat was very ancient. The Mohammedan countries use a great many chickens, and the demand is met in this way.

Mr. N. C. Meeker.—There is a good reason for that. The labor of one of those Copts or Arabs is not worth much more than the time of a setting hen.

Mr. Solon Robinson.—The thing has been tried again and again. Bring me the first man who will say that he has made anything by it, and I will believe in it.

Dr. Adolph Preterre said he had been making experiments for many years, and was perfectly satisfied that artificial hatching could be made profitable. He has two sets, one of one hundred and thirty, and another of one hundred and sixty eggs, now hatching. He gets generally eight chickens from every dozen eggs. The process has been much improved by the use of kerosene for heating, as its warmth was more uniform than that of any oil lamp. There is a French apparatus so adjusted that the falling of the mercury rings a bell, as also its rising, thus giving a note of alarm the moment the heat becomes insufficient or excessive. When my chicks appear, I give them nothing for twenty-four hours. Then I feed with boiled egg, chopped fine, and Indian meal, cracked corn, millet, wheat, &c., as others do. Next week I will bring my apparatus before the Club.

Prof. S. D. Tillman.—The question is not one of scientific curiosity, but a matter of dollars and cents. Does it, in any case, pay better than the usual mode of obtaining chickens? Eccaleobions have often been tried in Europe, but do not seem to be successful. They require some care and oversight by intelligent beings, and perhaps on this account the artificial plan is found the most expensive.

Mr. S. E. Todd.—The time of a setting hen has been spoken of as little worth. Now, if the eggs are taken from her, a hen will keep on laying, and give her owner four or five dozen eggs in the time required to hatch and raise a brood.

Mr. Wm. Lawton.—One hen for setting in every five is a good rule. I see no use in resorting to an expensive and curious machine for enabling me to dispense with the summer labor and productiveness of four hens.

### SEED POTATOES.

Mr. Wm. S. Carpenter showed a few fine tubers of the Harison and the Early Goodrich.

Mr. J. C. Thompson, Tompkinsville, Staten Island, said a few good things about cutting up potatoes for seed. The planter should begin at the stem end, and cut so as to give a piece of the mother potato with each eye. In this way one large potato can be made to yield seed enough for a peck. Each eye ought to give four pounds. He thought the Harison a very productive variety, and good for the table.

### BEE KEEPING.

Mr. P. L. Barton, of Salisbury, Conn., says, last fall he buried two hives. One weighed forty-two pounds, and there were four pounds consumed by March. The other weighed thirty-two pounds, and there were six pounds consumed. He buries under a mound two feet deep, leaving no breathing place. The bees came out in the spring well and thriving. In no other way can ill-stored hives be wintered so well.

Mr. Jasper Hazen, Albany, N. Y., gives the following practical directions and the statistics of bee-keeping:

1. In commencing work in the spring, as the working force increases, they continue to occupy the room until the whole space is improved by such number of workers as can be conveniently accommodated. All the working force more than this clusters out and waits the movement of the queen to lead them to a new home.

2. The hive with the largest number of boxes will have them filled in nearly the same time that the boxes will be filled, where there are but one or two boxes on a hive.

3. *Demonstrated.*—In the spring of 1867, I had four Eureka hives of the pattern exhibited. Two of them gave two swarms each, and with their swarms, two hundred and three pounds of surplus honey. Two of them gave no swarms, but gave two hundred and ninety-seven pounds of surplus honey. As fast as workers were multiplied, they entered the boxes, until the eighteen boxes were filled with workers. The two that gave no swarm, gave the eighteen boxes of surplus, each before colonies in two neighboring apiaries had filled two boxes. One apiary was within two rods, the other within eighty rods. The bees were at work in all the eighteen boxes at the same time.

4. *Expense.*—In what class of hives will surplus honey cost most by the pound? It cannot be expected that surplus boxes for one hundred and twenty-five pounds of honey, and a hive sufficiently large to make room for the swarm, and to cover the eighteen boxes, can be made or purchased with the boxes, as a simple box hive with two surplus honey boxes. But in the use of which, will surplus honey cost least by the pound? With which hive can we secure five hundred pounds of surplus at the least expense? Mr.

Quinby, in his work upon bee-keeping, in his first edition, estimates the annual average product, in the common swarming hive, at one dollar's worth of surplus. This, at twenty cents per pound, would be five pounds per swarm. In his second edition, he estimates it at two dollars' worth; this would be ten pounds per swarm. Five hundred pounds of surplus, at the first estimate, would require one hundred swarms. His second estimate would require fifty colonies. But improvement in hives has led to more favorable results. Some apiaries, in some classes of hives, have averaged fifty pounds per swarm. Our average, in the four Eureka hives, in 1867, was one hundred and twenty-five pounds—five hundred pounds of surplus from the four. If we estimate the price of hives with their boxes, in all but the Eureka hives, at three dollars each, and the Eureka hives, with their boxes, at eight dollars, and swarms at five dollars each, we have this result: It will require, on Mr. Quinby's first estimate, one hundred hives, three dollars each, three hundred dollars; estimate, one hundred swarms, five dollars each, five hundred dollars; amount of outlay, eight hundred dollars; one year's interest, fifty-six dollars. Swarms may be good, on an average, four years; one-quarter of five hundred dollars, one hundred and twenty-five dollars. Hives will be good for ten years; one-tenth of three hundred dollars is thirty dollars; cost of surplus per five hundred pounds, two hundred and eleven dollars; cost per pound, forty-two cents and two-tenths. According to his second estimate, it would be one-half of this; five hundred pounds would be one hundred and five dollars and fifty cents; per pound, twenty-one cents and one-tenth. Some have secured an average of fifty pounds. This is a high average. The result would be: Ten hives cost thirty dollars; ten swarms cost fifty dollars; outlay, eighty dollars; interest on eighty dollars, five dollars; one-tenth the cost of the hives, three dollars; one-quarter the cost of ten swarms, twelve dollars and fifty cents; cost of five hundred pounds of surplus, twenty-one dollars and ten cents; actual outlay per pound, four cents and one-quarter. Four Eureka hives, at eight dollars each, cost thirty-two dollars; four swarms, at five dollars each, twenty dollars; outlay, fifty-two dollars; interest on outlay, three dollars and sixty cents; one-tenth of hives, three dollars and twenty cents; one-fourth of swarms, five dollars; cost of five hundred pounds surplus, eleven dollars and eighty cents; cost per pound, two cents and eighteen-fiftieths. Cost per pound: Euraka hive, two cents and eighteen-fiftieths; in one of the swarmers, six cents and one-quarter; according to Mr. Quinby's last estimate, twenty-one cents and one-tenth; first estimate, forty-two cents and two-tenths. It will be seen that in the estimate of cost of honey by the swarmer hive, it costs twice as much per pound. Produced according to Mr. Quinby's best estimate, it costs ten times as much, and by his first estimate, twenty times as much as in the Eureka hive.

Another consideration is worthy of notice. One year's consumption by every colony, for breeding and for winter, cannot be less than sixty pounds.

One hundred swarms will consume six thousand pounds, and give five hundred pounds; one-thirteenth in surplus. Fifty swarms will consume three thousand pounds, and give five hundred pounds; one-seventh in surplus. Ten swarms will consume six hundred pounds, and give five hundred pounds; fifty pounds less than one-half in surplus. The four Eureka hives will consume two hundred and forty pounds, and give five hundred pounds; twenty-six pounds more than two-thirds in surplus. Further: A field that would sustain one hundred swarms, and give five hundred pounds surplus, if occupied by thirty-five swarms in Eureka hives, would lose but two thousand and one hundred pounds for the sustaining the swarms, and the keepers would receive five thousand three hundred and seventy-five pounds in surplus.

Shall we furnish our bees with facilities for their labor, that secure to us more than two-thirds the fruits, or shall we be satisfied with less than one-half, with one-seventh, or one-thirteenth? I should add, two of the four colonies gave two swarms each. Product of the four, four swarms and five hundred pounds of surplus.

The regular subject was then taken up.

## DEEP TILLAGE.

Dr. C. W. Grant, Iona Island, N. Y.—In breaking up sod ground, two methods of laying the slice obtain, each of which is adapted for special purposes; one turns the furrow slices over flat, leaving the newly plowed field as nearly level as possible. This leaves an entirely new surface exposed to the atmosphere, and that the lower portion of the slice that is most in need of the ameliorating action of "weathering." Another consideration is that it stratifies in the right direction to maintain homogenity in the portion subjected to tillage. The importance of both of these conditions will come under consideration again. The other method of placing the slice is to turn it only to an angle of forty-five degrees, which leaves the field a succession of rectangular ridges. One advantage of this plan is that it exposes more new surface to the atmospheric action, in the proportion that the two legs of a triangle are longer than the hypothenuse. Another advantage is that the angles of the ridges present points more salient and advantageous for attack in the farther operations of disintegration than the flat surfaces. The disadvantages are, that the extent of surface exposed is not all of it that which it is most desirable to have receive the atmospheric action, and that one-quarter or one-third of the surface that it is most desirable to have acted upon is shut out from that action by being overlapped by the following furrow. In both these cases the width of the slices must exceed the thickness or depth of plowing by at least the proportion of seven to nine. Thus, to make a furrow seven inches deep, the slice must be nine inches wide, and to turn to an angle of forty-five degrees, it must be ten inches wide. To make a furrow fourteen inches deep, it would require eighteen or twenty inches of width. As the width of the slice increases, the disadvantage of the oblique direction in stratification becomes greater, rendering it difficult to gain the thoroughness of disintegration and the homogenity by mixing, that are important for evenness of growth, and the best condition of vegetation.

The advantages and disadvantages of either method will be affected somewhat by circumstances, so that an absolute rule, universally applicable, cannot be had, and it is not very important when the depth of plowing does not exceed six inches; but when the depth becomes greater than six inches or thereabout (noting nice points of difference), the stratification of the angular position begins to be in some degree objectionable, from the difficulty in the after working of securing homogenity, or uniformity of fertility horizontally, and especially when the soil is turned up from any greater depth than has been heretofore exposed. This may be called "wrong stratification," in plowing. The soil may, for illustration, be divided imaginarily into horizontal layers of one inch in thickness; now, in order to secure evenness of growth, we must have a great degree of uniformity of texture and quality throughout the length and breadth of each of these imaginary layers, and going to the depth of ten or twelve inches, the disadvantage of wrong stratification becomes of sufficient importance to demand attention, but the remedy is not to be found in flat turning, which is impracticable by ordinary plows with this thickness of slices.

On stubble or unsodded ground, thorough mellowing or comminution and commingling, as well as turning up an unexposed surface to the atmosphere, must be regarded as an important point in the operation.

The advantages of thorough disintegration and intimate commingling, as it can be done by skillful operators with the spade, in comparison with the best work that is done with the ordinary plow, harrow and cultivators, were clearly set forth in a prize essay many years ago in Scotland. The trials were made on hundreds of acres, and seemed to demonstrate the fact that it was profitable in that country to employ the spade instead of the plow, from the increase of crop and diminution in the need of manure, consequent upon thoroughness of working. Recent statements of the results of extensive operations by Alderman Mecchi, are to the same effect. Innumerable experiments show clearly the advantage in productiveness of spade labor over that of the plow per acre, but whether, on the whole, more profitable at, European rate of wages, remains unsettled.

The question now arises: What is the best kind of plow for fulfilling any or all of these indications? And the answer will be in general terms, like the following: The one that performs the work required in the best and most uniform manner, with the least expenditure of draft, maintaining the most steady movement with the greatest ease in management by the plowman, being easily portable, and not disposed to break or soon wear out.

Lightness of draft and thoroughness of disintegration, or mellowing, must always, to some extent, stand in opposition to each other. Plows of lightest draft must always be those that move the soil in mass, or wholeness of furrow slice, with the least interior disturbance or breaking to pieces. Breaking or comminution must always require power in addition to that for turning.

Lightness of draft depends upon length and "easiness of lines"—that is, comparative smallness of angles between them and the direct line of motion of the plow.

A simple rule for the construction of plows, that admits of almost universal application, except for those designed to work in the most adhesive clay soils, was published by the Rev. W. L. Rham, in his *Dictionary of the Farm*, and was adopted as a theory of construction by the Messrs. Ransome, of Ipswich, England, about forty years ago. Briefly stated, it is "that the lines in the direction of the motion of the plow be always straight, with constantly increasing angles-on rising from the sole of the plow upward, these lines all starting in a segment of a circle, or an ellipse at the breast or forward part of the plow."

If the merits of public benefactors were to be estimated by the amount of material comfort conferred, James Smith, of Deanston, Scotland, the inventor of draining and subsoiling, would have few peers.

The subsoil plow, invented by him, is now known wherever we have accounts of agricultural operations. It is very simple in itself, and more simple and far more easy of draft than when he left it. An inclined plane on one side, as he made it, being found to add nothing to its efficiency, but greatly to its draft, has been omitted. It is of the first and lowest grade of deep-working implements, and when we call it deep-working, it must be understood in a qualified meaning, for it is not intended, except in a small degree, to prepare the subsoil for the reception of the roots of plants. It follows in the furrow of a tillage plow, for the purpose, first, of breaking up the indurated bed, that forms generally just beneath the depth at which tillage plows have worked, during whatever period the land may have been under cultivation, rendering it susceptible, in some degree, to ameliorating influences, and enabling it to afford some little assistance to the support of plants, by the feeble entertainment of their roots. But the chief advantage in these cases will be the gradual preparation that will fit the subsoil to be brought to the surface at length, with the need of a smaller degree of enrichment added than would otherwise be required; second, to lower the water-table so that the roots of plants may have the whole thickness of the fertile layer in healthful condition; third, to open water-courses, that will act as a temporary substitute for drainage; and fourth, for the special purpose for which it was invented, to hasten the action of drains, by opening water-passages down a considerable distance toward them. The idea sometimes entertained, that subsoil plowing will greatly aid in the direct preparation of ground for orchards and vineyards, is fallacious, often leading to disappointment. The subsoil cannot be rendered healthfully fertile, except by being brought to the surface and receiving the ameliorating influences of the atmosphere in connection with amendments or enrichments. The subsoil plow is not calculated to improve any porous soils, whether of sandy or gravelly texture, unless they contain a large admixture of friable shale that will be disintegrated and made fine by the action.

The propriety and importance of deep working becomes a clearly-established fact in the minds of every observing cultivator, on whatever soil he may operate, very soon after he begins experimentally to aim at the production of maximum crops, whether the subjects of cultivation be herbaceous or woody, annual or perennial; and the first and most obvious way of achieving it has heretofore been with the spade. But the expense of doing it by hand-labor constantly turned attention to the plow. Large plows were made, but the inevitable law of greater width than depth of furrow, and very imperfect tillage in consequence of the wrong stratification, have proved to be persistent objections against the employment of plows, in addition to the rapid increase of the power required, that was found to be always greatly disproportioned to the work.

But necessity, stronger than the opposing difficulties, advanced the work of deep tillage greatly, both by spade and plow.

Orchards which would fail just as they should become fairly established in bearing whenever this was neglected, and vineyards, which would generally decline before reaching what should be their best condition, when compared with the rapid advance and perpetually thriving condition of those for which a proper course of preparation had been made, were a constant lesson to those who were ready to read it. The observing cultivator would, of course, examine the condition of the roots, and this would leave no doubt as to the cause of failure. Thorough preparation being made before planting, the orchards and vineyards come to full maturity of bearing in less than half the time required under scanty preparation—the quantity, quality, and certainty of production were even in greater proportion, and age brought no decline.

During the century that elapsed between 1768 and 1868, cultivation grew, by increase of knowledge, in England, from a rude necessity far toward establishment as a scientific art, and each year an advance has been made toward that high degree of improvement, by the most minute and careful observation, to verify the true relation between cause and effect, and deep-working plows lead the advance. Of this no one need entertain a doubt who will read the accounts of the recent yearly trials of implements.

The famous Vallerand deep-working plow led in France. Its prophetic name was "Revolution." Some account of its achievements were easily given, but more time than I shall occupy would be required for a brief abstract of its doings and results on one of the many farms that have adopted it. It is a large plow, making slices fourteen inches thick and eighteen wide, drawn by six or more strong oxen.

There are two other plows that have become historic from the very great and valuable results that they have produced, but neither claims to perform perfectly the work of thorough reversal of the soil without some aid from hands and spades. One is the Great Jersey trench plow, of the Isle of Jersey, whence it was introduced to England some twenty-five years ago. The other is the Bonnet plow, of France. It is known chiefly in the South of France, where it came into use, but its popularity is now extending very rapidly.

In good soils, prepared in the best manner, accurate and extensive observations have shown us that the roots of apple trees do not choose to come nearer than one foot to the surface, and that they will generally occupy a stratum about one foot in thickness, more or less, according to compactness or porosity of soil, the variation not being very great.

For apples and pears, then, we can see that more than two feet depth of thorough trenching is required for perfect preparation, and we shall come to agree with the best cultivators that, in general, three feet is not too much for true economy.

The deep, fertile bed of soil is required in either case; that which is too compact being rendered porous, and that which is wastefully open being made sufficiently retentive by all of the appliances for ameliorating soils.

It is quite clear that operating soils to the depth of three feet, by the spade, can never extend beyond an area of a few square rods on each farm. Hence a true and rational agriculture requires of us to produce and use plows especially adapted to thorough trenching, and disintegration to a depth constantly reached by the implements in general use by all good cultivators on the continent.

Prof. S. D. Tillman.—The remarks of Dr. Grant have thrown light on questions which cannot be too frequently discussed. This problem of plowing must be clearly solved before we can reach that point in successful farming which insures uniform and abundant crops. The practical farmer is not now sure of a fair return for his labor. It is to be hoped that repeated experiments in the application of scientific principles will yet reveal all the conditions essential to his complete success. Cultivated lands, like human beings, have absolute wants. Our soils, as well as we ourselves, need light, air and warmth. In general, our fields are made less fruitful by drenching than by drouth. The presence of water in the surface soil drives off heat and excludes the air. In homogeneous soils there can be no question as to the benefit of deep plowing. The greater the surface exposed, the greater will be the amount of air absorbed. Every shower prepares the soil for a fresh supply of air. It is not improbable that in many cases deep plowing will preclude the necessity of under-draining. The main benefit of judicious drainage is the elevation of the temperature of the land, for, in many kinds of soil, warmth is more important than moisture. The surplus store of water, deep in the ground, is carried up by capillary attraction, as the surface soil becomes dry during the warmer months; but when this supply is greater than is needed, the excess of evaporation tends to lower the temperature of the soil. Several years ago, the Marquis of Tweeddale caused experiments to be made to ascertain the precise effects of drainage on the temperature of the same kind of soil growing the same crops. It was shown thereby that, except in midsummer, when increased heat is not needed, the effect of drainage was to increase the mean temperature of the soil at the depth of thirty inches below the surface about one degree and a half. That showers of cold rain and sleet lowered the temperature of drained land two degrees, and undrained four degrees. Dr. Madden found that an excess of water in the soil reduced its temperature six and a half degrees, which he estimates is equivalent to an elevation above the sea level of nearly two thousand feet. Two fields, side by side, and equally well cultivated, one only being properly drained and the other undrained, would show a great difference in product. The undrained field would produce no more than a drained field at an altitude two thousand feet higher. Furthermore, he calculates that one hundred cubic inches of moderately pulverized soil contains twenty-five cubic inches of air. Every acre cultivated to the depth of eight inches will, therefore, retain 12,545,280 inches of air, and for every additional inch cultivated by deeper plowing, two hundred and thirty-five tons of soil are brought into activity, and rendered capable of retaining within it 1,568,160 additional cubic inches of air. The lateness of the hour prevents further discussion of this subject to-day, but I hope it will again be taken up.

### FRUIT BASKETS.

Mr. David Lyman, Middlefield, Conn., being introduced, said that at last he had become acquainted with a process by which a good, strong, handsome, durable fruit basket can be made for one cent—ten dollars a thousand. He had none for sale, and the invention has not as yet been applied to such an extent as to furnish the article for marketing the present crop. The basket is made by cutting a thick shaving or veneer from a circular block. The section of the tree is dressed sloping, so as to have the shape of a frustrum, or of a thimble, and set in a lathe, where it makes 120 revolutions in a minute. A groove is at the same time cut in the lower edge, into which the bottom is slipped, the joint being a dovetail. The upper rim is made thick for strength, and for fruit baskets, small slits are cut in the sides enough to admit air, and not enough to weaken the dish. By taking large blocks a half bushel peach basket may be cut almost as cheaply as a quart vessel. By another year Mr. Lyman engages to supply fruit-growers with a better dish than they ever used, and at a lower price. It is not likely to warp and crack, because it is cut aslant of the grain. Green timber may be used, and a log cut into baskets, and shipped to strawberry-growers within two days, from the stump.

Mr. A. S. Fuller said he knew of no better basket, none nearly as good, for the price. He had known a small fruit-grower to get seven cents more a quart for his berries simply because they came to market in clean, handsome baskets. The two best baskets now in use are the Beecher and American. He thought this equal to either of them, and a hundred per cent cheaper.

Mr. Wm. S. Carpenter.—This seems a great invention. I have had experience with most of the various styles, and I like this the best, for a cheap article.

Mr. Solon Robinson.—I have been watching a long time for just such a package as this, and I predict its success.

### CHALLENGE CHURN.

Mr. John E. Cryer exhibited a churn worked by a lever that runs up and down on a screw of very sloping thread. The raising and dropping of the handle causes the paddle to revolve vertically, in the cream. The merit of the invention is the ease with which it is operated. The churn was referred to Mr. Wm. S. Carpenter, to whom the inventor will furnish one, and he will upon trial report on its utility and practicability.

### NIAGARA ASH SIFTER.

Mr. D. S. Trowbridge, Stamford, Conn., showed a neat and effective instrument for sifting ashes so as to raise no dust at all. An oblong, cast-iron box has a movable grate on which the coals and ashes are thrown; a few movements of the handle separates the ashes. Of seven tons of coal consumed in the usual way, one is thrown away in cinders and half-burnt pieces.

The Chair suggested that he appear before the Club in the fall, when people are interested in warming apparatus.

### CORN CULTIVATOR AND HARROW.

Messrs. Rich & Meisler, exhibited a model of a harrow and cultivator combined. It is built high, the axeltree curving up like a bell yoke, so as to go astride of corn when it is four feet or more high. It cultivates a width of six feet—two intervals between rows, so that it is driven over every alternate row. It will till ten acres a day. The cultivators can be changed for harrow teeth in a few minutes. The rims of the wheels are four inches wide, whole weight of the instrument, 400 pounds; cost $100. The Chair suggested to the inventor that he make a working model, and show it in practical operation, so a committee of the Club can form a satisfactory opinion of its merits and report on the same.

Adjourned.

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## April 28, 1868.

Mr. Nathan C. Ely in the chair; Mr. John W. Chambers, Secretary.

### BLACK KNOTS IN CHERRY TREES.

Mr. E. Taintor, Harford, Cortland county, N. Y.—About twenty-five years ago, my cherry trees, as was generally the case in this vicinity, were killed by the black knot. Observed grubs in the knots while they were in the green state, in the months of June and July, and supposed that the grubs caused the knots. Procured another kind of trees which had not then been attacked by knots, and which were supposed to be proof against them. For twenty years or more, no knots appeared on them, but in June, 1865, while building a garden fence, some of the trees being in the way, and finding many knots on them, and knowing the fate of my trees twenty-five or more years before, I resolved to cut them down. This was the first year of their reappearance. Opened several of the knots, found grubs in them about three-eighths of an inch in length. The fruit at this time was about two-thirds grown. Supposed that there was no doubt that the knots were caused by insects.

Afterwards saw, in the reports of the Farmer's Club, that those knots were not caused by insects, and thought I would make a more thorough examination next year. Accordingly, the next year (1866), seeing the knots were making their appearance, commenced examination the last of May, soon after the blossoms had fallen off. The knots were then in the green state, and not half grown, and to my surprise could find no grubs in them, nor anything that I thought would ever produce a grub.

In about a week examined again; did not at first find any grubs, but on a closer exmination found small, dark, irregular lines extending from the outside towards the central portion of the knot; examined very carefully, cutting off little by little, with a sharp knife. The knot at that time was in a kind of cheesy state, and cut easily. I found at the inner end of these dark lines, a little grub, not more than the thirty-second part of an inch in length, nor larger than No. 50 spool sewing thread. I had no trouble after this in finding grubs.

In another week they were from a sixteenth to an eighth of an inch in length, and of corresponding size, and had penetrated further towards the center of the knot.

Thinking the question settled, that the knots were caused by insects, I paid but little more attention to the subject this year; but seeing that some of the correspondents of the Farmers' Club cannot find grubs in the knots, and do not think they are caused by insects, I resolved I would try again and make a more thorough examination.

In 1867, commenced examination as soon as the leaves started, the season being about two weeks later than usual, and perhaps two weeks later than at New York city. Did not discover any knots far enough advanced to crack open, until May 30; then I examined every day for thirty days.

The knots commence their growth with the circulation of the sap in the spring, so as to produce the growth of new wood, and can be readily discovered as soon as the blossoms begin to make their appearance, and before they are in full bloom. The knots are generally on twigs of the last year's growth, and can readily be discovered before they have progressed far enough to cause the outer bark of the twig to crack open, which generally takes place while the blossoms are on the trees.

The twig commences swelling for a distance varying from three-quarters to three and a half inches up and down its length, and in the course of a few days, causes the outer bark of the twig to burst open from the internal pressure of the growing mass.

Upon examination by cutting, it will be found that the old wood of the twig has turned dark colored, or has dark streaks running up and down it for the space of one-third of the length of the now rapidly growing knot. When further advanced, the wood of the knot will cleave off from the old wood of the twig, forming a cavity which afterwards becomes the habitation of the grubs.

I supposed at first, that as this spot appeared to be the center of the difficulty, and the place from which the knot appeared to develop itself, that if they were caused by insects, I should here find the ova, or egg which formed the grub, but in this I was mistaken.

After about two weeks from the first appearance of the swellings which form the knots, and a week or ten days after they are so far advanced as to crack open, the ova, or egg of the insect, may be discovered by careful examination. The first that I discovered this year was on June 10th. At that time I discovered but two, in examining perhaps twenty knots; perhaps a part of this was owing to my want of skill, or experience in the business.

When the swelling first bursts open, the pulpy woody substance, of which the young knot is composed, is of a light green color, but turns dark with age, until it becomes nearly black; is rough and irregular in form, and has several little indentations in its surface, which have something of the appearance of having been bitten in, by some small insect. In these little indentations or cavities, the eggs are deposited, only one in a place, and from one to about half a dozen—generally three or four—in a knot. I have never been able to find but seven in any one knot, and that only in one instance.

The eggs are sometimes in sight but not often, being generally imbedded in the woody substance, a little one side of the indentations, or cavities, above spoken of, and but a very short distance from the outside of the knot, and in such a manner as to make one think they have worked themselves in since they were deposited.

These eggs are very small, and not easily discovered; therefore one must look sharp and be careful, or he will not find them. By taking a sharp knife and cutting off, little by little, from these indentations, if you have good luck, you will find a little egg, about as large around the small way as a period mark, and around the other way perhaps a third larger. I did not succeed in detecting the insect that laid the eggs, though I examined the knots morning, noon, and night. I could not discover any eggs in the knots until they were about as thick as a man's little finger.

In about a week or ten days, the eggs commence hatching, and at first, the grubs are very small, and more difficult to discover than were the eggs, but they have now fairly commenced in life, and set up housekeeping for themselves, the woody substance of the knot furnishing both food and shelter.

The grub makes its way, directly to the cavity, in the center of the knot, and by the time it arrives there, is perhaps three-eighths of an inch in length.

Subsequent examinations convinced me, that the grubs perfect their growth and leave the knots by eating through the outside, and falling to the ground, soon after the time the fruit naturally ripens, where they remain, and are transformed into insects, and come forth in the spring to renew their depredations.

I think the knots are commenced by a bite, or sting, of an insect, which poisons the sap, arrests it in its flow to form the wood, leaves, and fruit, and this poisoned sap forms the knot, which becomes the breeding place, and food for the succeeding generation.

Mr. A. S. Fuller.—This has been said many times, but there is no evidence that the knots are made by the worm any more than finding a horse in a barn is any proof that the horse built the barn. The curculio will sting any part of a tree soft enough for him to pierce. He goes to the young fruit mostly, but often deposits his eggs in these black knots; but he does not make them. The remedy for this disease is pruning. A well-trimmed cherry tree will not have black knots.

Mr. Wm. Lawton said his experience coincided with that of Mr. Fuller. The remedy, or rather the preventive, of black knot is the judicious use of the pruning knife.

### BEESWAX.

Mr. James Church, Oswego county, N. Y., wants to know how bees make wax.

Dr. J. V. C. Smith, of Boston.—Bees have the power of making or secreting wax from their own bodies. They make it in the little black rings of the abdomen, then remove and use it in cell-building, as they require room for honey.

### SUPERIOR WINTER APPLES.

Mr. D. Odell, of Wayne county, on Lake Ontario, exhibited and presented to the Club some apples of fine flavor, and in admirable preservation. The varieties which he thinks most of for winter are Northern Spy, Peck's Pleasant and Baldwin.

### THE CHICKEN-HATCHER.

Dr. A. Preterre brought before the Club his apparatus for artificial egg-hatching, spoken of at the last meeting. He says most of the difficulties of former arrangements have been overcome. His lamp is fed from a reservoir of oil, so that a heat very uniform is applied to the water, over which a sheepskin, with the wool on, is laid, the eggs on the wool. The first week the heat should be about one hundred and four degrees; the second week about ninety-six degrees. He has attached to his lamp a metallic thermometer, so connected with a small battery that when the heat rises too high a bell is constantly rung to give alarm. So, also, when the cold is too great for the eggs, the bell rings. In this way the process gives him little trouble. He hatches eight out of twelve eggs on an average, and finds it profitable to raise all his own poultry in this way. Dr. P. invites all persons who would know more of this process, and see it in constant use, to call at his office, No. 159 Bowery. He thinks the alarm thermometer, which makes the process so much easier, can be applied for about five dollars. He invented and made the arrangement he showed. Quite a brood of chicks, some two weeks old, and others just hatched, were taken from his basket, and ran about the Club room, picking up apple seeds, to the great amusement of the ladies and children.

### SOLON ROBINSON ON FLORIDA.

This veteran of the agricultural press has of late returned from Florida, where he passed the winter. He took the stand, and gave us, in an informal way, his impressions about that distant and much talked of State. As to climate, nothing can be more agreeable than a Florida winter. It snows never, and rains seldom. He has been out hunting and exploring all winter, has slept on the ground without a tent, and been well all the time. It is the first winter for many years that he has been able to pass without two or more attacks of bronchitis. The general look of the country is that of a sandy desert, overgrown with pines. But the soil is by no means as sterile as it first appears. The white color is given in part by sand, and also by small white shells, which, as they disintegrate, furnish the elements of fertility. Such a soil will give two thousand pounds of sugar to the acre; yet millions of these acres can be had at fifty cents. Florida shows marks of having been much more cultivated than it is now. One sees in the woods the old hills of corn, and rows of sugar cane. A generation ago, the English had some flourishing plantations along the St. John. In 1822 it came into American possession, and the tide of immigration was strong. This was arrested by the Seminole war. Just as the State was recovering from that back-set, the civil war broke out. Hence, at present, Florida is practically a wilderness. The population is sparse and poor. Now, they are much discouraged, for the cotton crop was last year a failure. The best business for a permanent settler in Florida is the cultivation of an orange grove. He was surprised to find so few in the State. An orange tree begins to bear at five years of age. Then it is worth a hundred dollars, for it is a poor small tree that does not yield one thousand oranges; some bear as high as ten thousand; five thousand may be taken as an average. They sold this year at about five dollars per hundred, for the Florida oranges are unusually large, sweet and fine flavored. The orange tree grows wild. It is dug up when small, in the woods, and transplanted, the roots and limbs being very much clipped. It is very tenacious of life, and survives rough handling, but not the frost. Orange groves in Florida were killed by the cold in the winter of 1835, but not since. The best region for oranges is the head of Indian river. But this is so remote and difficult of access, that he does not advise settlers to go there at present. They should keep near the St. John's river, where they can get to the New York market in four days. He says a great deal of money can be made, and easily made, by raising fruit and vegetables, and sending them directly to New York or Charleston. Every climate has some drawbacks; there are a good many musketoes and fleas and snakes in Florida; the summers are long, though not sickly, and most new settlers have a few chills, but the attack is usually very mild. The health of soldiers is never better than when stationed in Florida. There is little or no yellow fever. The timber by far the most frequent is the long-leaved pine, but he saw hickory, pecan, live oak and ash, though not in abundance. The pine is not of much size, a tree two feet through being considered large. On Indian river the banana grows, as also the pineapple and other tropical fruits.

The tobacco, grown on fresh soil, from Cuba seed, is equal to any produced in Cuba. The apple does not flourish well in Florida, but peaches grow with no cultivation or care, and of the finest flavor. There is no reason why any invalid in quest of balmy climate should go to Italy. Nor is there any need for our going to Sicily for oranges. Florida will give us all the tropical fruits and plants we want; and this sunny clime is only four days remote from the wharves of New York.

Dr. J. V. C. Smith said the proceedings of to-day clearly illustrated the value of the American Institute Club. Here we get from the lips of the most experienced and careful of observers, a condensed lecture on Florida, of the greatest value to those who want information about those regions; and we have artificial incubation illustrated and explained, in the most striking and picturesque way, by one who thoroughly understands the art and carries it on with profit.

### PLANTS AND SHRUBS.

Mr. Wm. R. Prince, Flushing, L. I., has presented to the American Institute the seeds of the following flowering plants and shrubs. They are for gratuitous distribution: Chinese Bignonia Grandiflora, Amorpha Lewisii (blue spikes), Large Roseate Hibiscus, Japan Variegated-leafed Maize, Japan Blue-striped Lily, Large Yellow Hypericum, Splendid Flowering Yucca, Halbert-leaved Hibiscus, Purple Perennial Aster, Blue-flowered Lobelia, Columbine (various colors), Blue and Purple Perennial Lupin, Hibiscus Grandiflorus (cream colored), Starry Liatris, Crimson Monarda, Baptisia Cerulea, Balsamon Lady Slipper, Lythrum Salicaria, Flame-colored Bignonia, Large White Hibiscus, Chinese Pink Spiræa, Blue Blazing Star, Scarlet-flowered Bignonia, Indigo Shrub, Pink-colored Asclepias, Scarlet Trumpet Flower, Large Pink-flowered Hibiscus, Prince's Bright Crimson Bignonia. Also, Pyrenian Spinach seed, enough for one thousand papers. It is a very hardy perennial, will grow in any soil, and starts its leaves at the first opening of spring, furnishing an ample supply of early greens of excellent flavor. It is invaluable for the North, as the earliest of all vegetables.

### CHINESE YAM.

Mr. Wm. R. Prince, Flushing, L. I.—It is a native of Northern China and Tartary, and will withstand the severest winters in the open ground. Its flavor is between the Mercer potato and arrowroot. It is exceedingly farinaceous, and may be used for every purpose to which wheat flour is applied. It is the only vegetable which contains an equivalent of azote for the development of the muscular power of a man, equally with meat, and thus renders meat as food unnecessary in China and Japan. The product far exceeds that of any potato, and it never rots, but will remain perfect for a year. It will flourish best on the sandy lands of New Jersey, Long Island, and the whole coast range, which have been hitherto deemed valueless, and its culture may be successfully extended to the most northern limits, and to all the British territories. There are more than fifty varieties, white, yellow and red, and varying in length from seven inches to two feet. It is this most prolific and nutritious of all vegetables which has always preserved the 400,000,000 of the Chinese from famine, when other countries, far less populous, have been direfully afflicted by the deficiency of food.

### BEES.

Mr. E. G. Holcomb, Brasher Iron Works, N. Y.—There are but few successful bee-keepers in this section. I think they do not inform themselves so as to be competent to manage as they ought. The style of hive makes some difference, but nothing near what is generally claimed. Bees cannot make honey; they only gather it. If the season is good, the hives well filled with worker combs, excluding nearly all drone combs, allowing but few swarms, and giving them a good start in the boxes, with clean, empty combs, you may expect good returns, taking off boxes as soon as filled, and replacing them with empty ones. Quinby on Bees, is an excellent work for those wishing information on this subject. One thing regarding the manufacture of wax: all authorities with which I am acquainted, say that the scales of wax are detached from the abdomen of the bees by using a claw on the hind legs. From this I differ, having watched them repeatedly. One bee takes the wax from between the rings of the abdomen of another, with his forceps, and chews it till ready for use. Bees brought in the first pollen the thirty-first of March, fifteen days earlier than last year. According to previous observations, I have found the various crops of the season to keep pace with the first blossoms.

### A PRAIRIE IMPLEMENT.

Mr. J. F. Doud, Plattsmouth, Nebraska.—Last spring I made a harrow for destroying weeds, which cost but three dollars, and benefited me many times that amount. The shape is like the letter A. It is in length sixteen feet; its width in the widest place, twelve feet. It is made of oak scantling, two by four inches. It has two cross bars so constructed that the drag may be spread wide or narrow, at pleasure. The teeth are forty-penny nails, one hundred and twenty-eight in number. Each side of the harrow should be made of two pieces of scantling, which can be fastened together with a hinge, so as to rise and fall to suit the inequalities of the surface. I halved mine together, fastening them with a bolt, somewhat smaller than the bit the hole was made with. Those acquainted with prairie farming, will remember that when each man is expected to cultivate twenty-five or thirty acres of corn, most of the land must be plowed a long time before the corn is planted, and that the weeds are often an inch high when the corn is coming through the surface. That is the time to go over the ground with this harrow. It will take these small weeds out by the roots and leave them on the surface. If hot weather follows, the weeds will soon be past all hope of recovery. If wet weather follows, they will be put back ten days, as a plant transplanted will not commence to grow in much less time. If corn is planted when the ground is wet, or if wet weather follows, a crust is formed over the surface which hinders the plant in coming through. This harrow breaks up the crust and pulverizes every lump of earth. Potatoes need about the same treatment. Last spring being wet, the weeds on my potato ground were about an inch high, and thick as they could stand, when the potato plants were an inch below the surface. I went over the ground with this harrow until it looked the same as it did the day it was plowed, and though wet weather followed, when the weeds were again an inch high the potatoes were three inches high. I am confident that cach hand on prairie soil can cultivate five acres more of corn with this harrow, used at the right time, than with any other machinery now in use.

### GALVANIZED IRON TRELLISES.

Mr. Wm. W. Wilcox, Middletown, Conn., exhibited specimens of his iron trellises for fruit, flowers, and vegetables. These trellises are made of galvanized iron; the arms can be bent into any shape; two of them form a handsome circular trellis.

Mr. A. S. Fuller.—This trellis is an excellent article, very ornamental, and is just what is wanted by amateurs.

The Secretary.—I have tried these trellises and find them very convenient for inclosing flowering plants, which keep them in a very compact form, and when the season is over they can be taken up and kept for another year. Adjourned.

# POLYTECHNIC ASSOCIATION PROCEEDINGS.

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## May 2, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Secretary.

The following scientific memoranda were presented by the Chairman:

### GRAPHITOIDAL BORON.

Wöhler has ascertained that this body, originally described by him as pure boron, is a definite compound, consisting of two equivalents of boron and one equivalent of the metal aluminum.

### NEW USE OF ELECTRIC LIGHT.

During a skating fete last winter, the Bois de Bologne was brilliantly illuminated by means of fifteen electric lights, produced by the use of fifteen batteries, each containing forty Bunsen cells.

### THE PARIS BELT RAILWAY.

On the 26th of February last, this railway was formally opened. It is twenty-two miles in length, including the branch to Mount Parnasse, and is entirely within the city limits. It crosses the river Seine by two bridges, about seven miles apart.

### HYDROPHOBIA.

Youatt states that he has been several times cured of the bite of a rabid animal, by rubbing into the wound crystals of nitrate of silver. However, the susceptibility of individuals to venom is so various, that probably no specific will be found for this terrible disease. The nitrate of silver contains, according to the new notation, one atom of silver, one of nitrogen, and three of oxygen; therefore, its name, according to the new chemical nomenclature, explained in our Transactions for 1865, is *Argamanit.*

### SELF-REGISTERING ANEMOMETER.

This instrument, invented by Gen. Morin, has been successfully used in ventilating the amphitheater of the Conservatoire des Arts et Métiers, Paris. It has an electric counter which has worked for two years, by means of a battery on the system of M. Marie Dary, without being replenished with the sulphate of mercury. It has also been successfully applied to the hospital of Laribosiére; the allowance of fresh air for each bed being sixty meters per hour, or 6,120 meters for one hundred and twenty beds.

### THE SPIROMETER.

This instrument measures the actual volume of air respired by a pair of human lungs, and as an index of health and vigor. On medical authority it is stated that examinations for life insurance have revealed the fact, that persons who habitually drink ardent spirits between meals, have not the power to blow up the spirometer to the point due to their size and weight. By this means individuals, not previously suspected of intemperance, have been detected.

### VESSELS FOR HOLDING HYDROFLUORIC ACID.

The engraver on glass is often at a loss for utensils to hold his acid, but Stolba mentions that glass and porcelain vessels are protected from the action of hydrofluoric acid (*alaf*) by a thin coating of paraffin (a mixture of hydrocarbons), which is put on by carefully cleaning and heating the vessel, and melting some paraffin in it, and moving it until the whole surface is covered, when the excess of paraffin is poured off. By this plan, both lead and gutta percha vessels may be dispensed with.

### EXPANSION OF CRYSTALS.

A very ingenious plan for determining the coefficient of expansion has been devised by Fitzeau. He gives the formula expressing the expansion in any direction, as well as the cubical expansion; and having determined the expansion in the direction of one of the three axes of a crystal at twenty degrees, forty degrees and sixty degrees C of heat, he deduces the expansion for each degree. The crystal to be measured is placed with one side on a platinum support, and a polished glass plate is arranged above the surface, leaving a small interval. By means of an alcohol flame, with salt, he produces the Newtonian rings; with the aid of a telescope he counts the number of fringes passing beyond certain fixed points of the support, and notes the changes made by the application of heat.

### HYDROCARBONS FROM HERRING.

The distinguished American chemists, Messrs. Warren & Storer, have obtained from menhaden oil, an animal fat contained in the species of herring known as *alosa menhaden*, crude hydrocarbons, which, on being rectified, gave a product very closely resembling refined coal oil and petroleum in color, odor, and illuminating properties. The naphtha obtained from the crude product, by Warren's process of fractional condensation, has been subjected to repeated distillations. After nearly a year spent in experiments, they have separated sixteen bodies of constant boiling point, which were found to be hydrides of the higher alcohol radicals, and the more dense homologues of amylene and benzole. These investigations have an important bearing on the question of the origin of petroleum.

### THE CRYSTALLINE LENS.

M. Melliot has presented a memoir to the French Academy of Science, on the regeneration of crystalline lens when extracted in a state of health. The animals are operated upon under the influence of chloroform, and in order to facilitate healing of the cornea, the eyelids are closed by one or two sutures, which ordinarily fall between the third and fifth day, when the operation proceeds successfully, but earlier when suppuration of the eye takes place. His experiments prove, incontestibly, the regeneration of the lens, and that the vessels, in the order of their reappearance, follow the phases presented during their embryonic evolution. The regeneration generally commences at the end of the second week after the operation, and is not complete till from the fifth to the twelfth month; even longer time is required for perfect restoration, if the animal be aged.

### MILK SICKNESS.

The *Medical and Surgical Reporter* states that the affection of cattle known as "milk sickness," is caused by eating the white snake root, *eupatorium ageratoidis.* This discovery seems to have been made by three separate observers, at about the same time. One of them, Mr. William Jerry, of Edwardsville. Ill., in 1860, gathered this plant by mistake for the nettle, and eat it as boiled greens. On the day following, he was suddenly seized with violent trembling, prostration and faintness, and on the next day with vomiting and violent retching. He did not fully recover in five years, and in the meantime tried the plant on domestic animals with similar results. Dr. Amos Sawyer, of Hillsboro, Ill., Mr. R. N. Lee, of Nokomis, Dr. McPheeters, of St. Louis (botanist), and Mr. Enno (chemist), all coincide in the opinion that milk sickness is caused by this hitherto unsuspected plant, which animals are said to like when it is in bloom.

### A NEW HORTICULTURAL PROCESS.

At the last meeting of the Agricultural Society in India, the Rev. Mr. Ferminger communicated a plan by which the stones of fruit may be reduced or made to disappear, and the pulp increased in size and flavor. At any time during the cold season, select a branch that is to be used afterward for inarching. Split it up carefully somewhat less than a span long. From both halves of the branch thus split, scoop out clearly all the pith; then bring the split halves together again, and keep them bandaged till they have become thoroughly united. At the usual time, the beginning of the rains, inarch the branch thus treated upon suitable stock, taking for the place of union the portion of the branch just below where the split was made. Upon a branch of the tree thus produced a similar operation is performed, and so on for successive seasons; the result being that the stone of the fruit becomes less and less, after each successive operation. This process has been applied, likewise, to the grape vine at Malaga; and plants thereby have been produced which bear the finest fruit, without the slightest vestige of a stone within them.

### NEW BRIDGE OVER THE PO.

A railway and road-bridge crossing the river Po, at Mezzana Corti, has just been completed. It consists of ten spans of one hundred and ninety-six feet each, with piers and abutments; its total length is three thousand, three hundred and ten feet. The superstructure is of two lattice girders, twenty-four feet, six inches deep, placed twenty seven feet, three inches apart, connected above and below with cross girders of plate iron. The lower system of cross girders carries a double line of railway, and the upper a roadway. The novelty of this bridge is in its substructure, and the plan for completing it. Iron caissons, forty-nine feet long, nineteen feet wide, and eight feet and eight inches deep, open only on the bottom, but entered on the top by means of four tubes provided with skips and equilibrium chambers, were sunk at right angles to the line of the bridge on the site of the piers. After the water has been removed from within the caissons, by means of compressed air, which was also used to exclude the water, the whole interior was filled in with concrete introduced by means of the tubes. This material will be turned to stone long before the iron inclosing it can waste away by oxidation.

### THE GAIN OF CARBURETTED GAS.

The process of passing ordinary coal gas through a volatile hydrocarbon, for the purpose of increasing its illuminating power, recently introduced both in this country and Europe, seems to be quite generally approved. *Once a Week*, in a late number, says the advantage of the process is not confined to the increased light, but there is less vitiated air and less heat engendered by the combustion of carburetted, than of common gas—always providing that proper care be taken, by the use of suitable jets, to insure the perfect combustion of all the gas that issues from the burners. Without such provision any gas, carburetted or not, will smoke or give off noxious vapors. As evidence of the perfect working of the invention, that journal cites, upon the authority of the manufacturers, that several thousand of these carburettors have been supplied to various consumers, large and small, since its introduction, and that these have been maintained in continual use, without trouble and without detriment. Some of the street lamps at the West-end of London are, at the present time, burning "carburetted" gas—the lamps around Trafalgar square, to wit—and several of the public offices in London likewise adopt the carburetting principle.

### VIBRATION ILLUSTRATED.

Prof. Tyndall, of the Royal Institution of London, has arranged an apparatus for representing to the eye, on a large screen, the vibratory action of solids producing various musical tones. In this way he demonstrates that a string has, besides its general vibratory movements, segmental vibrations, between which are nodes or points of rest. In one case a rod was held in a vise in such a way that, by means of a strong light, its shadow could be thrown upon a screen; on being struck sharply at certain points it was made to divide itself into two or more vibrating segments and half segments, the former showing themselves as shadowy spindles, the latter, as fans upon the screen. The nodes were designated by dark points of stationary shadow.

In another case, a tuning fork was connected with a fine platinum wire, heated by a galvanic current. When the fork gave forth a sound, the hot platinum wire responded to the vibration, and, its middle portion swinging through the great arc, was soon cooled. On being slackened, the wire resolved itself into two or more vibrating segments having heated nodes, on account of the rapid moving and consequently cooled portion of the wire allowing more of the electric current to pass. The wire had the appearance of luminous spindles intensely bright at the point, and fading into darkness at the base.

## ARTIFICIAL FRUIT ESSENCES.

The following table, from *Dingler's Polytechnic Journal*, shows the number of parts of each compound to be added to one hundred parts of alcohol, to make fifteen different artificial essences. Glycerine is found in nearly all these mixtures, and seems to blend the flavors of the several ingredients. It will be observed that a majority of these ingredients are combinations of radicals of the alcoholic series with the fatty acids. The last four named acids are used in the form of alcoholic solutions saturated in the cold:

| | Peach. | Apricot. | Plum. | Cherry. | Black Cherry. | Lemon. | Pear. | Orange. | Apple. | Grape. | Gooseberry. | Raspberry. | Strawberry. | Melon. | Pineapple. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Glycerine (*Echarlilt*) | 5 | 4 | 8 | 3 | .. | 5 | 10 | 10 | 4 | 10 | .. | 4 | 2 | 3 | 3 |
| Chloroform (*Arlid*) | .. | 1 | .. | .. | .. | 1 | .. | 2 | 1 | 2 | .. | .. | .. | .. | 1 |
| Nitric Ether (*Echalnit*) | .. | .. | .. | .. | .. | 1 | .. | .. | 1 | .. | .. | 1 | 1 | .. | .. |
| Aldehyde (*Artachel*) | 2 | .. | 5 | .. | .. | 2 | .. | 2 | 2 | 2 | 1 | 1 | .. | 2 | 1 |
| Acetate of Ethyl. (*Echal-artachalt*) | 5 | .. | 5 | 5 | 10 | 10 | 5 | 5 | 1 | .. | 5 | 5 | 5 | .. | .. |
| Formiate of Ethyl. (*Echal-artalt*) | 5 | .. | 1 | .. | .. | .. | .. | 1 | .. | 2 | .. | 1 | 1 | 1 | .. |
| Butyrate of Ethyl. (*Echal-artichalt*) | 5 | 10 | 2 | .. | .. | .. | .. | 1 | .. | .. | .. | 1 | 5 | 4 | 5 |
| Valerianate of Ethyl. (*Echal-artochalt*) | 5 | 5 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 5 | .. |
| Benzoete of Ethyl. (*Echal-ecurlet*) | .. | .. | .. | 5 | 5 | .. | .. | 1 | .. | .. | 1 | 1 | .. | .. | .. |
| Œnanthylate of Ethyl. (*Echal-arteachalt*) | 5 | 1 | 4 | 1 | 2 | .. | .. | .. | .. | 10 | 1 | 1 | .. | .. | .. |
| Sebacic Ether (*Echalem-eicherot*) | 1 | . | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | 10 | .. |
| Salicylate of Methyl. (Oil of Wintergreen) | 2 | 2 | .. | .. | .. | .. | .. | 1 | .. | 1 | .. | 1 | 1 | .. | .. |
| Acetate of Amyl. (*Uchal-artachalt*) | .. | . | .. | .. | .. | .. | 10 | 10 | .. | .. | .. | 1 | 3 | .. | .. |
| Butyrate of Amyl. (*Uchal-artichalt*) | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 2 | . | 10 |
| Valerianate of Amyl. (*Uchal-artochalt*) | .. | .. | .. | .. | .. | 10 | .. | .. | 10 | .. | .. | .. | .. | .. | .. |
| Essence of Orange | .. | .. | .. | .. | .. | .. | .. | 10 | .. | .. | .. | .. | .. | .. | .. |
| Tartaric Acid, Sol. (*Thel-orleat*) | .. | .. | .. | .. | .. | 10 | .. | 1 | .. | 5 | 5 | 5 | .. | .. | .. |
| Oxalic Acid, Sol. (*Thel-erot*) | .. | 1 | .. | .. | 1 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. |
| Succinic Acid, Sol. (*Thel-echerot*) | .. | .. | . | .. | .. | 1 | .. | .. | .. | 3 | 1 | 1 | .. | .. | .. |
| Benzoic Acid, Sol. (*Thal-ecurlat*) | .. | .. | .. | 1 | 2 | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. |

## *DEODORIZED INDIA RUBBER.*

Mr. T. Bourne exhibited specimens of deodorized caoutchouc to the meeting. The process by which they were freed from the offensive smell, consists in sprinkling the rubber, raised to a heat of about 60 degrees Fahr., with powdered charcoal. The exhibitor claimed that a diaphram of this kind of rubber, inserted in a lager-beer keg, will keep the beer fresh, by preventing contact with common air, until it is all consumed. Also, that the rubber will resist the action of the vapors arising in petroleum barrels.

Dr. Vanderweyde spoke strongly in favor of the invention, but denied both the latter positions taken by the inventor, as to its value in beer and petroleum barrels.

## THE MICROSCOPE.

Dr. Vanderweyde exhibited an improved microscope, and insisted on its immense value to the chemist in discovering, by means of polarized light, the presence of certain organic substances which could not be detected with the spectroscope. He explained the method of taking microscopic photographs, and showed some pictures of *entozoa*. He mentioned numerous objections to the binocular microscope, and gave many interesting facts touching the use of the most improved forms of microscopes which had been brought to great perfection by American makers of objectives. After which, the Association adjourned to next Monday evening.

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## Addendum.

We give below a description of the proposed Broadway Underground railway, which was presented before this Association by Samuel Nolan, on the 28th day of February last. (*See p.* 830 *of the volume of Transactions for* 1866–7.) The engraving of the plan was not furnished in time to be inserted in that volume, and will now be found at the commencement of the report for this year:

### THE PROPOSED BROADWAY ARCADE RAILWAY.

The rapid growth of New York city in wealth and population, with the corresponding increase in trade and travel, have so crowded the thoroughfares and overburdened the means of transportation, that the imperative demand for relief has naturally awakened the active thoughts and creative faculties of many minds. Among the numerous plans presented, apparently the most complete and comprehensive is that of the "Arcade railway," projected by Hon. Melville C. Smith and H. C. Gardiner, Esq.

The plan has been received with general favor by the public and by engineers. Of the latter, Gen. E. L. Vielé, Hon. William J. McAlpine, C. L. McAlpine, Gen. C. B. Stuart, Gen. I. F. Quimby, Gen. D. C. McCallum, Col. J. W. Adams, Silas Seymour, W. H. Green and D. E. and I. B. Culver, among others, have given it their hearty indorsement.

On another page is an illustration taken from a view near Wall street, looking up Broadway.

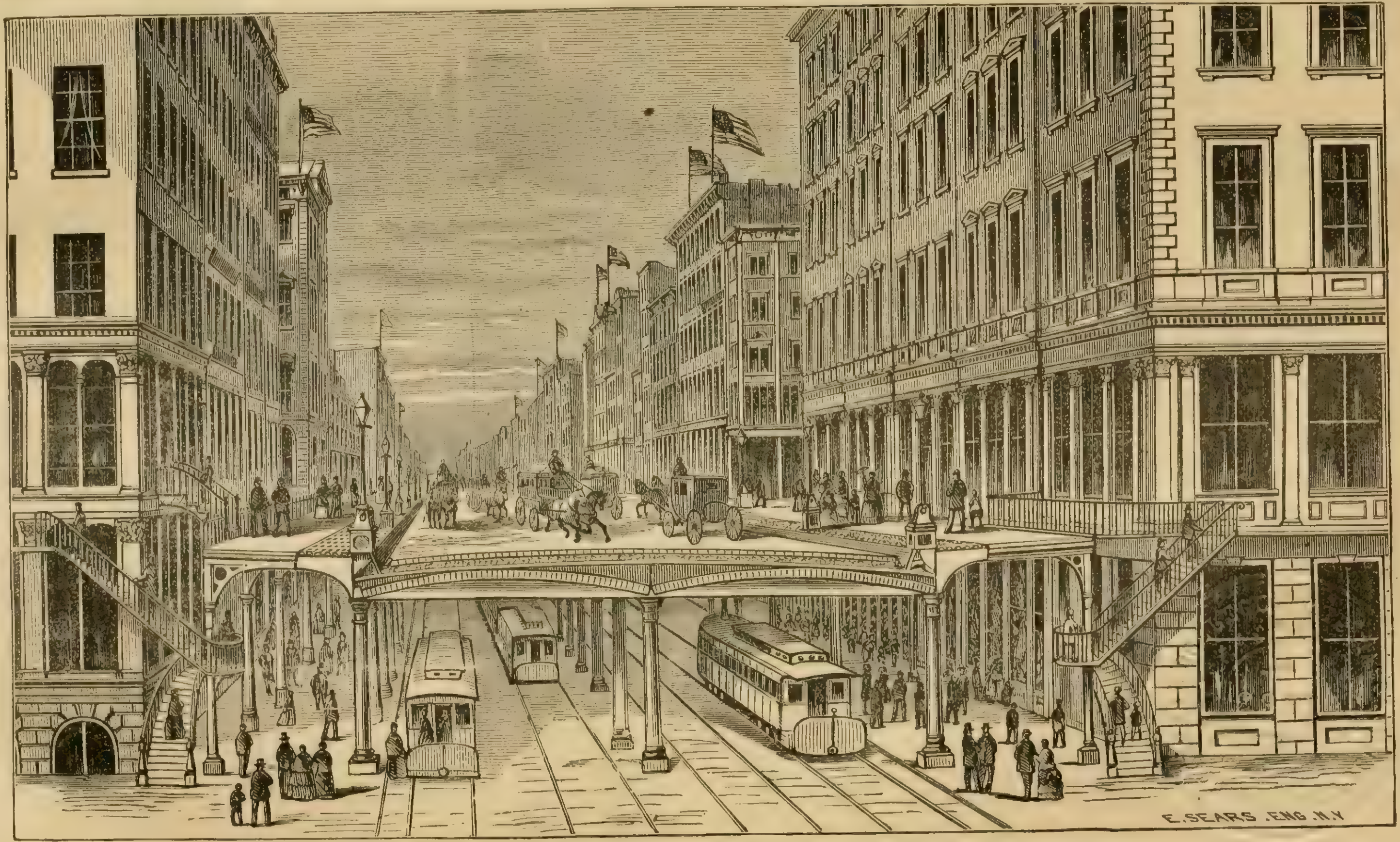
The following is a brief description of the plan, and of the advantages claimed:

This is an *under surface* railway, which contemplates the use of the entire width of the streets and avenues under which it passes. The excavation being made to a depth of some fifteen feet, extending to the line of areas, the sidewalks and roadway are replaced at their present level on groined arches of solid masonry, springing from heavy iron columns, which rest upon secure foundations, the masonry of the arches being rendered water-tight by an impervious asphaltum coating. Upon this is formed a roadbed of dry sand, rammed and rounded to receive a pavement which need never be disturbed until entirely worn out. The water-pipes gas-pipes, sewers, telegraph wires, hydrants, lamp-posts, and all other matters of public necessity connected with street thoroughfares, are provided for in the design in a more complete, convenient, accessible and systematic manner than at present. The whole length of the arcade thus constructed is lighted and ventilated from the open area adjoining the buildings, by means of which, also, free and ready ingress and egress is afforded to the arcade at all points of the route. The sidewalks of the arcade correspond with the sidewalks of the streets, and under the street are laid four lines of railway, two for rapid transit, and two for way passengers.

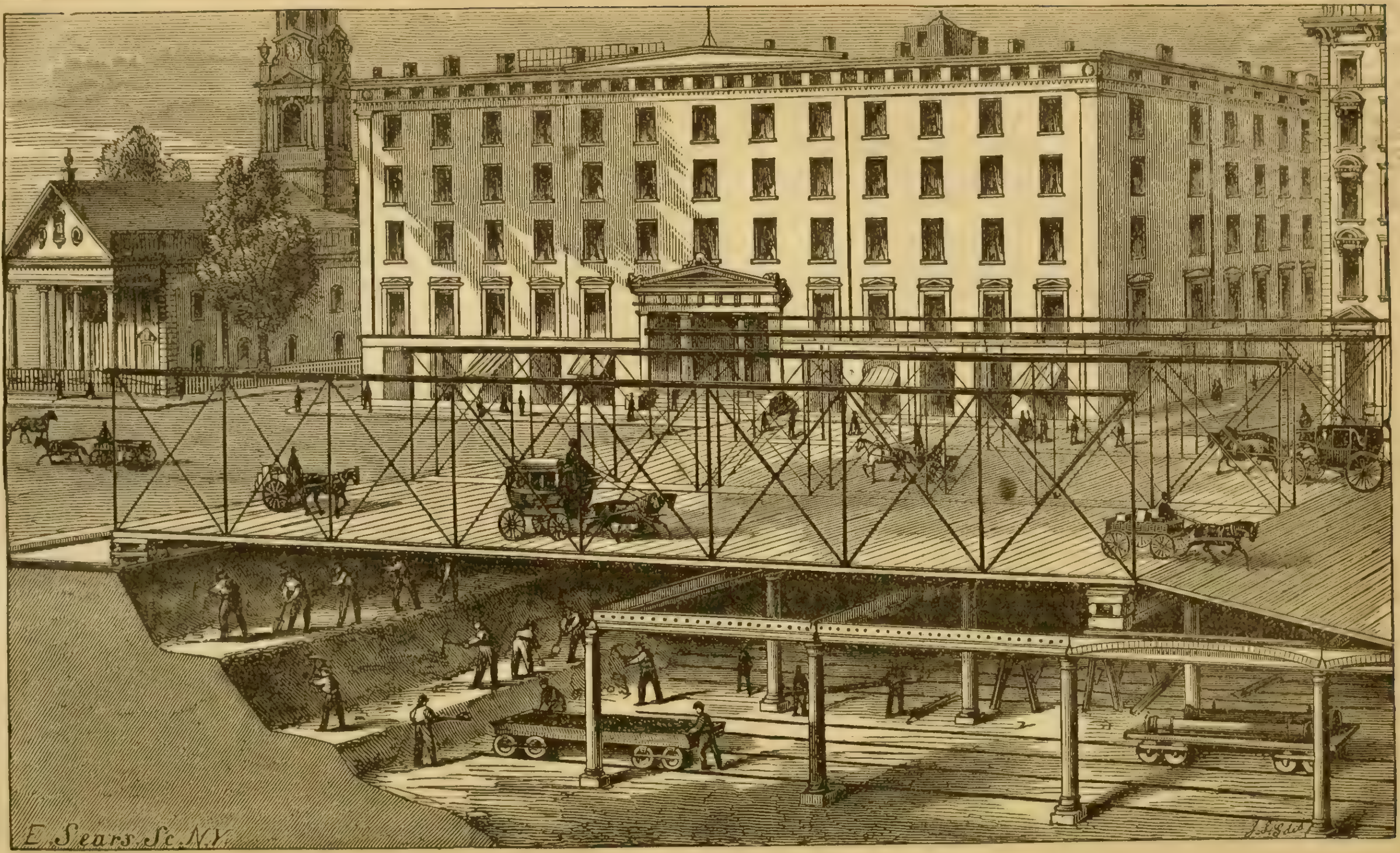
The lower or basement stories of the buildings along the route are opened upon a broad, well lighted street, and can be used for all the purposes to which the first floor is adapted, or any purpose of trade or manufacture, making, therefore, just as many new places of business as there are buildings along the line. At each street crossing vaulted transepts are constructed, which, while increasing the facilities of ventilation, add so much new space for commercial storage, markets, or other purposes; and where the route adjoins a public square, the whole of the line for that extent can be used in like manner. The cars being always under a covered way are never exposed to the weather, and can be constructed upon principles of thorough ventilation.

Whenever any portion of the coal vaults are taken, additional room of equal value and capacity will be constructed at the expense of the company, beneath the lower sidewalks. Should the excavation be of a greater depth than the foundation of the buildings, the same will be carefully secured by thorough underpinning.

The open area ways, with the addition of dead lights in the side-


E. SEARS .ENG. N.Y.

NEW YORK ARCADE RAILWAY. Designed by S. B. B. NOWLAN.


E. Sears Sc. N.Y.
J. J. S del.

PLAN FOR BUILDING THE ARCADE WITHOUT INTERRUPTION TO TRAVEL.

## Plan for Building the Arcade without interruption to travel.

The work on the Arcade will be commenced by placing along the line of the roadway, two iron bridges of about 300 feet in length, and each 18 feet wide in the clear, and along the line of sidewalks corresponding bridges each about 12 feet wide. These bridges to be supported at intermediate points.

The floor of these bridges will be elevated four feet above the grade of the street, and the difference in elevation overcome by a gentle ascent at each end.

These trusses are skeleton frames, and will form but slight obstruction to the view, and will permit pedestrians to cross the streets at all places.

The panels are made separate and bolted together, and may be taken down from one end and added to the other with great facility.

Convenient access to and from the bridges will be provided for, and the work on the railway will be carried on beneath, without using the street either in the removal of excavations, or in bringing materials to construct the road: the completed Arcade being ample for these uses, and affording abundant store-room for all the purposes of construction.

The street in front of an ordinary building would be occupied by the bridges and workmen about one month, and during this time (by the plan proposed) the occupants of the building would suffer but little inconvenience, and the street travel little, if any obstruction.

walks (if necessary), would afford perfect daylight to the street and stores below.

The excavation and construction may be begun and carried on at many points along the route at the same time, and temporary, movable bridges will prevent any obstruction to travel during the progress of the work.

A detailed statement, made by competent engineers, shows the entire cost of the road to be about $2,000,000 per mile, which is one-third less than the cost of the London tunnel roads, owing to the great expense of their ventilation.

*Route.*—The route proposed for the road is the line of Broadway, from the Battery to the Central Park; thence by a suitable route to connect with the Hudson River railroad; also with a branch from Union Square to connect with the Harlem railroad.

*Advantages.*—1st. Having four tracks, it affords rapid transportation for both freight and passengers, with full accommodation for the way travel, thus completely relieving Broadway, an advantage not even claimed for any other plan.

2d. It combines the advantages of both the tunnel and elevated ways, and avoids the disadvantages of each, being strong and safe and admitting of rapid speed, and at the same time being airy, light and pleasant for travel.

3d. That access to and exit from the road, and to and from the cars, will be more easy and attended with far less difficulty than at the present time, to and from the street cars or omnibuses.

4th. The surface roadway will be greatly improved both in appearance and utility, and there will be comparatively no dust in dry, and no mud in wet weather. All surface water would be conducted to the sewers through the hollow columns of the arcade.

5th. Pedestrians will find the sidewalks less crowded, and the lower one will be sheltered from the storms of winter and the sun in summer. Being thus free from the snow and rain, dust and heat, it will become a safe and pleasant promenade.

6th. The water and gas mains being so easily accessible, can be repaired, and the distributing pipes connected without disturbing the streets.

7th. The sewerage of the city will be greatly improved, and can be opened and repaired with facility and without any inconvenience.

8th. The whole work is to be accomplished without requiring any sacrifices at the hands of property owners, and without the expense of a dollar to this over-taxed city.

9th. That the property on the street will be improved in value to more than the cost of the road, an additional basement story being added to each building, and that story being rendered the most valuable on account of the facility with which goods can be delivered to and taken from it. The rent of the basement stores thus created would, at the moderate estimate of $2,000 rent per annum, over the worth of the present cellars, yield the property owners more than $3,000,000 per year—an amount sufficient to pay, in a short time, the entire cost of the road.

10th. That it will be of great benefit to the interior of the State, inasmuch as nearly all the imported goods pass through the city, and the cost of freight and the cost of transacting the business are added to the original cost of the goods, and the consumers pay not only this added cost, but a profit thereon.

11th. While it provides the most abundant means for rapid transit and relief of the streets, it does not block up any part of the city, but, on the contrary, adds enormously to the available street space—in short, adds to the city an immense avenue, which is to traverse the heart of the metropolis, increasing its wonderful attractions, augmenting the value of its property, and giving to the people the great boon of sure, rapid and cheap communication.

12th. Instead of being offensive to the eye and disfiguring the street, as some of the other systems inevitably must, it will, from its open construction, be an ornament to the city, forming an elegant arcade, surpassing any other street in the world for the magnificence of its design and the utility of its arrangement.

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## May 9, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Secretary.

The Chairman opened the proceedings by reading the following notes on scientific progress:

### A NEW THALLIUM MINERAL.

A selenide of copper, silver and thallium has been found in Norway, and analyzed by M. Nordenskiörd. It contains seventeen per cent of thallium.

### CHINESE SUGAR GRASS.

It is said that this grass (*sorghum tartaricum*) is not only perfectly hardy, and bears from six to eight times the quantity per acre that wheat does, but that the bread made from it is more nourishing, and goes further than any other. The leaves and stalks also are valuable food for cattle.

### IODIDE OF SILVER PHENOMENON.

Fizeau, in continuing his researches on the dilation of minute crystals, found the chlorides, bromides and iodides following the same law of expansion by heat, with the exception of iodide of silver (*argamav*). The crystals of the latter salt actually contract instead of dilating by the application of heat.

### PRODUCTION OF ANILINE.

Kekulé has published a very simple process for obtaining the compound from which some of our most beautiful colors are made. An acid solution of bichloride of tin (*stanamed*), is added to nitrobenzole (*earulanet*); a reaction ensues in a few moments, great heat is developed, and aniline (*eareelan*) is produced. When means of moderating and controlling the action are found, the process may be used on a large scale.

### EXTRACTION OF POTASH AND SODA FROM FELDSPARS.

M. Daubrée placed feldspar and distilled water together in a cylindrical vessel, to which was given a rapid rotation on its axis. By this movement the feldspar was found to undergo decomposition, and the water to become alkaline. Considerable quantities of potash and soda (*potamat* and *sodamat*) were separated—the amount varying with the quality of the rock operated upon.

### DEODORIZING VULCANIZED RUBBER.

M. Bourne has removed the disagreeable odor arising from India rubber, by covering the articles made of rubber with charcoal dust, and placing them in an inclosed vessel, which is submitted to a temperature of from seventy-six to ninety-four degrees Fahrenheit, during several hours. The articles, on being removed and cleaned, are found to be free from odor, and not the least changed in form, even in the most minute details.

### INSECT METAL-WORKERS.

A curious memoir has been published by Sjogreen, a Swedish naturalist, in relation to a spinning insect, which uses not only metalloids, but metals, in the manufacture of its thread. These insects are almost microscopic, and live beneath certain trees, especially in the province of Smaland. They spin like silkworms, and produce a kind of ferruginous cocoons, which constitute the mineral known under the name of "lake ore," and which is composed of from twenty to sixty per cent of oxide of iron, mixed with manganese, and ten per cent of chloric, and some phosphoric acids.

### TEXTILE FABRICS AS FOOD.

The inhabitants of the London Zoölogical Gardens seem to have a liking for manufactured fibrous substances, quite as marked as that of the beaver for the bark of trees. Some time since the boa constrictor swallowed his blanket, and quite lately the sea bear died from eating canvas, several pieces and a hook having been found; it is supposed he was injured internally. Cases like these may be noticed among tame animals; for instance, in Jersey City there is a dog which has such a propensity to swallow cotton and and linen cloth, that it is unsafe to leave a lady's cambric handkerchief within his reach.

### WEATHER SIGNS IN THE SKY.

The British Board of Trade has published, for the benefit of seafaring men, the following: The colors of the sky at different times afford wonderfully good guidance. Not only does a bright sunset presage fair weather, but there are other tints which speak with clearness and accuracy. A bright yellow color in the evening indicates wind; a pale yellow, wet; a neutral gray constitutes a favorable sign in the evening—an unfavorable sign in the morning. The clouds are full of meaning in themselves. If they are soft, undefined and feathery, the weather will be fine; if the edges are hard, sharp and definite, it will be foul. Generally speaking, any deep, unusual hues betoken wind and rain; while the more quiet and delicate tints bespeak fair weather.

### HEAT CHANGES PRODUCED BY MIXING DIFFERENT LIQUIDS.

In the second paper presented by Messrs. Bussy and Buignet, at the French Academy of Science, the following conclusions are arrived at:

1. In all the cases under examination, with one sole exception, the calorific capacity of the mixture is a little superior to the mean capacity of the elements.

2. By a singular opposition, the liquids for which the increase of bulk is the most considerable, are exactly those which develop most heat at the moment of their union, such as ether and chloroform, alcohol and water, sulphuric acid and water. Meanwhile,

the only instance hitherto noticed of a diminution of bulk, is the mixture of chloroform and bisulphide of carbon (*eralid* and *ares*); a decrease of heat takes place at the moment of union.

3. Aside from the loss of heat resulting from a change of volume, there exists a cause which absorbs heat equal, and sometimes greater in amount than that given out by the combination of liquids. This cause, perhaps, may proceed from the separation of homogeneous particles necessary for the diffusion of the liquids.

### ACTION OF LIGHT ON IODIDE OF LEAD.

M. Schmidt, in the *Bibliotheque Universelle de Geneve,* arrives at the following conclusions by experimenting with paper coated with a mixture of iodide of lead (*plubamev*) and starch:

1. The iodide, when in a perfectly dry condition, remains unaltered when exposed to light.

2. When kept in a moist state, it is decomposed by light.

3. In order to effect its decomposition, the iodide must remain in contact with the atmosphere. Iodide of lead mixed with starch, or with an alcoholic solution of gum guaiacum, remains perfectly unaltered when exposed to light *in vacuo*, but changes to a bluish color immediately on air being admitted.

4. Pure iodide of lead, in a moist state, becomes decomposed in appreciable quantities by time; it assumes a more transparent color, and loses iodine, being converted into peroxide and carbonate.

5. The starch may be replaced by any other substance having a a tendency to unite with iodine.

6. A mixture of iodide of lead and starch remains unaltered in diffuse daylight, but becomes of a dark blue color when exposed to the direct rays of the sun.

Chloride of lead (*plubamed*) is not affected in any way by exposure to light.

### ABSORPTION BY THE SKIN.

In a paper addressed to the French Academy of Sciences, Dr. Scouttetten says the absorbing power of the skin may be promoted or prevented, according to the form under which the substance to be absorbed is applied to it. It is well known that the skin contains a large number of follicles, by which fatty matter is secreted, intended to lubricate it, and maintain it in a state of suppleness. The skin also contains glands which secrete perspiration. Perspiration, in being evaporated, does not carry away the various salts held in solution, but deposits them on the fatty matter, where they soon mix with the particles of all kinds conveyed by the air. This compound film, covering the skin, prevents the action of water. The imbricated structure of the epidermis is another cause which impedes the action of water on the skin. This is so true that, when water is collected under the skin by means of blistering, it cannot find an issue without some violent mechanical means, such as cutting or tearing open. A third cause which prevents the absorption of water and the salts it contains, is the cohesion of the aqueous particles themselves, for, though liquid, they are difficult to separate from each other, as daily experience proves. These three causes combined render the absorption of water by the skin impossible. But there are causes which facilitate absorption; such, for instance, is the gaseous form, which is eminently calculated to penetrate the pores; thus the absorption of oxygen is the cause of the pain one feels when the skin is scorched. So liquids that are easily volatilized may be absorbed, especially when they have the property of dissolving greasy substances; such, for example, are ether, chloroform, benzine, etc. Even solids, when capable of volatilization, will penetrate through the skin; camphor, musk and cantharides belong to this class. Lastly, certain solids, powdered and made into ointment with hog's lard, will, by friction, be absorbed by the pores, because the natural fatty film of the skin will be dissolved and converted into a sort of soap by the alkaline salts, and thus become assimilated with the medicinal substance. The question discussed by Dr. Scouttetten is of great interest to the large class of artists who, in the prosecution of their business, have to often handle photographic chemicals.

### EXPERIMENTS ON RESPIRATION.

Pettenkofer and Voit have made further experiments in the improved respiration apparatus, and have found that more oxygen is absorbed during sleep than when the person is awake, and that more carbonic acid gas is exhaled by day than by night, and much more when the person is engaged in labor than when comparatively inactive. On the night following a day of hard labor, there is an increase over the normal quantity of oxygen absorbed. The facts observed render it probable that oxygen is stored up in the body for several hours, where it assists in the process of slow oxidation of the nutriment taken during the day. Even on days of rest, the quantities of carbonic anhydride and water eliminated are greater than those which correspond to the bulk of oxygen absorbed during those days. The same quantities of carbonic anhydride are exhaled during the nights following days of work and inactivity, and evidently result from the muscular movements made during sleep; but on the nights following working days there is a great increase in water given off by respiration and perspiration. The same amount of urea is secreted in working as in resting days, showing that the work of the muscles is performed without an increase in the decomposition of albuminoid substances. This statement does not agree with the experiments made by Houghton as to the quantity of urea resulting from muscular or mental work. The general results obtained by the first named experimenters confirm those by Henneberg in 1861, when experimenting on oxen.

### ALUMINIUM ALLOY IN DENTISTRY.

A process for casting an aluminium alloy has been invented, which will furnish a very light foundation for artificial teeth, not affected, like gold, by sulphur compounds.

### A NEW PHOTOMETER.

Prof. Schönbein uses a solution of cyanin as a photometer. He finds the depth of color which it takes on exposure to light varies in proportion to the intensity of light, and that the phenomenon occurs also *in vacuo*. Cyanin is the coloring matter of certain flowers. It is contained in the blue petals of corn-flowers, violets and several species of iris. Marquart states that it is found in red and black, as well as blue flowers. It is extracted by means of alcohol. On evaporation to dryness the residue is treated with water to separate a resinous substance and dissolve the coloring matter, which is precipitated by means of the acetate of lead (*plubmealort*). The green precipitate, after being treated with water, is decomposed by sulphuretted hydrogen (*gelas*). After carefully evaporating the filtrate over a water bath, the residue is treated with absolute alcohol; lastly, the alcoholic solution is mixed with ether, which precipitates the cyanin in blue flocks. Cyanin, as thus prepared by Fremy & Cloez, is an uncrystalizable mass, which is decolorized by reducing agents, but it recovers its blue color on exposure to air. It has been supposed that red flowers owe their color to cyanin reddened by a free acid, which may account for the fact that certain flowers are red in the bud, blue in the blossom, and green when they begin to fade. Schönbein's photometer, like all others, depends for accuracy upon a correct estimate of tint by the human eye.

## *LIFE-SAVING RAFT.*

Mr. John Wright exhibited a model of his apparatus for saving life in case of shipwreck. Its peculiarity consists in its adaptability to being put in a small space on shipboard. The buoys can be made of cork, covered with canvas, around which is placed the folding deck. Eight of these folding decks can be placed in the space of an ordinary ship's boat. It is also very cheap. It can be built for about one hundred and fifty dollars. The lowest price of an ordinary life-raft is $550, and even this kind cannot be stowed away when not in use. Life-rafts, to accommodate an emigrant ship of twelve hundred passengers, would cover the whole deck, for at least forty of them would be necessary; whereas, this folding-deck can be rolled into a small compass, and the buoys stowed in the most convenient places.

## *NEW METHOD OF MAKING OVAL FRAMES.*

Dr. Warren Rowell exhibited specimens of Mr. John Sperry's oval picture frames, and explained their mode of construction. The wood is sliced up in veneers and glued together, and shaped in an iron mould. The ends are sawed off, and each layer meeting in the center of the other, thus lapping over the jointed part. The economy by this method is that the lumber to make these frames would, by the old process, cost ten dollars, while by this method it would be only four, and the same quantity of lumber will make twice the number of frames. The lumber is shaved off from the green log, and thus seasoned in three or four days, and put into the frames.

Mr. Dudley Blanchard stated that there was a waste of nearly twenty-five per cent in the usual way of sawing a log into one-inch boards, and these boards into shorter lengths, required in small work like picture frames.

## *GYPSUM OF NOVA SCOTIA.*

Dr. L. Feuchtwanger exhibited specimens of gypsum from Nova Scotia, and made some general remarks on this mineral and its geological position. According to Sir W. E. Logan, it is found extensively in Canada, especially in the Onondaga formation, which is the upper silurian. It is interstratified with dolomite and dolomitic marls. The gypsum formations extend along Northwestern New York, and from Niagara to Lake Huron, the most extensive beds being on Grand river, in Michigan, below the village of Cayuga. Large beds exist at Cayuga, in the State of New

York, extending into Ontario county on one side, and Onondaga county on the other. Large quantities are ground and sold under the name of "plaster," or "plaster of Paris." Gypsum is formed by the action of sulphuric acid on limestone, the sulphuric acid being derived from sulphurets, or volcanic vapor. Gypsum is a very abundant mineral, but is found most extensively at Windson, Harts county, Nova Scotia, from which place 100,000 tons of plaster are exported annually. The deposit is about one hundred and fifty feet wide and is probably fifty miles in length.

Prof. Vanderweyde remarked that Dr. Benjamin Franklin was the first to use gypsum as a fertilizer. He used to form the letters with it in the ground to spell the word "plaster," which the increased vegetable growth afterwards made visible. It is well known that soil that is deficient in lime will not produce grain.

Dr. D. D. Parmelee said the utility of gypsum was due to its holding moisture and giving it out when wanted. It holds water for a long time. Lime would part with it very quick.

Dr. Vanderweyde remarked that those who cast in plaster of Paris mix just enough for present use, as it dries very quickly. It can be prevented from setting quick by the use of lime, but this causes it to crack. Plaster of Paris does not shrink at all.

Dr. Feuchtwanger agreed with Dr. Parmelee as to the water-absorbing qualities of plaster of Paris, and this constituting its value as a fertilizer.

Mr. Hilton held that the great virtue of plaster consisted in its power of absorbing ammonia and giving it out to the plant.

The Chairman said chemists have not made it plain in what the acknowledged merit of gypsum, or natural sulphate of lime, as a fertilizer, consists. It is a very important question, and he proposed that it be resumed at the next meeting. Adjourned.

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## May 16, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Esq., Secretary.

The Chairman opened the proceedings by reading the following summary of scientific news:

### PROCESS OF BLEACHING GUM.

Picciotto states, that mucilage may be completely decolorized by means of recently precipitated gelatinous alumina, which fixes the color on itself and leaves a clear solution. Unless the mucilage is very deeply colored, the same alumina will serve for two operations.

### LIGNITE.

In Middlesex county, N. J., only twenty miles from the city of New York, lignite or brown coal is found in considerable quantities. It is estimated that 4,000 tons of marketable coal can be obtained from one acre of land. A company has been organized, and has leased 1,350 acres. It is said this fuel can now be sold in New York at three dollars per ton. The best vein is about seventy-five feet below the surface. If it were in rock it would pay to mine it, but as the shaft must be lined with timber, it is not probable that it could be taken out, at so low a cost, as to be sold even at the price of hard coal in the city of New York. This lignite contains some sulphur in the form of copperas (*fermasot*) which is very objectionable.

### TEST FOR TANNIN.

The *Moniteur Scientifique*, of Paris, says, tannic acid or tannin is now extensively used in manufactures. Although no fraud has been effected, yet, by reason of the high price of this product, it is well to be able to test it easily. Tannin being soluble in ether, one gramme of tannic placed in the testing tube and covered with ten grammes of ether, ought to be entirely dissolved in the latter.

### THE MAHOGANY TREE IN INDIA.

Dr. T. Anderson has reported to the British Government, that great success has attended the introduction of the mahogany tree into the Calcutta Botanical gardens. Several young trees brought from Jamaica and planted in 1795, were destroyed in the cyclone of 1864, after having attained an average size of twelve feet in girth, at four feet from the ground.

### THE VOLCANO AT SANTORINO.

The eruption at Santorino, in the Mediterranean, appears to be as active as ever. The detonations are exceedingly violent, and the lava is constantly flowing into the sea in five different directions. The crater which, in August last, was cleared of all appendages by a great explosion, is again crowned with a mushroom-shaped cap of scoriæ and lava. The motion of the soil is inconsiderable, yet, the several keys have sunk about a meter, while the bottom of some of the channels has risen many fathoms.

### AN IMPROVED WHITEWASH.

Dr. Jacobson has made a whitewash which is said, to be almost as durable as paint, by dissolving fifty parts of glue into one hundred and fifty parts of water, and adding two parts of caustic soda; after boiling, a flocculent precipitate separates, which may, however, be disregarded. After the mixture has cooled, he adds fifty parts of water-glass (*sodemakit*), and stirs in enough oxyd of zinc (*zincamat*), to make it of the proper consistence for painting. Two coats should be applied, and when dry, a solution containing ten per cent of choloride of zinc (*zincamed*) should be laid on, which gives it a beautiful gloss and great durability. It is well suited for wood, metal or brick, but should be applied as soon as made, for it cannot be kept long in the proper state.

### NEW DEVELOPER.

Mr. H. T. Anthony, of this city, has given to photographers the following recipe for a new developer: To a saturated solution of iron, add, drop by drop, a weak solution of tannin in alcohol, the mixture soon assumes a blue color; add acetic acid until that color disappears and afterward a few drops (about five to ten per ounce) of a two-grain solution of gelatine; finally add as much acetic acid as may be proper. Mr. Anthony has lately found that white loaf-sugar may be substituted for the gelatine, and will produce very brilliant negatives without the necessity of intensifying by redevelopment or otherwise. The keeping quality of this developer is said to be all that can be desired.

### ADULTERATION OF SAFFRON.

At a late meeting of the Chicago College of Pharmacy, an interesting examination was made of saffron. All the samples exhibited were proved to be adulterated, some containing as little as forty per cent of genuine saffron. The latter yields, with sulphuric acid, a bright purple color, while the adulterated becomes slightly brown. The darker hue, as well as the characteristic aromatic, acrid saffron taste is hardly perceptible in the adulteration, which has an insipid taste, owing probably, to the maceration or boiling resorted to, to color it yellow. The latter seemed to have been done by means of saffron. Our colleges of pharmacy, can render no higher service to the whole community, than to continue the investigation and exposure of adulterated drugs and medicines.

Dr. Feuchtwanger said marigold flowers had long been used to adulterate saffron.

## ILLUMINATING GAS.

Prof. Frankland, in the course of his last lecture before the Royal Institution, London, on coal gas, said he had just had the illuminating power of the gas supplied to different large towns, tested by standard sperm candles, and now holds written certificates of the results, as follows: Aberdeen, 35.0; Paisley, 30.3; Hawick, 30.0; Greenock, 28.5; Edinburgh, 28.0; Inverness, 25.0; Manchester, 22.0; Liverpool, 22.0; Carlisle, 16.0; Berlin, 15.5; Birmingham, 15.0; Paris, 12.3; London, 12.1; Vienna, 9.0. It will be seen that the gas supplied to Aberdeen gives nearly three times the light of the average gas furnished for London, which, in particular instances, only equals nine candles. The gas in London is now worse than it was many years ago, although the methods of manufacture have been cheapened by the discoveries of science; all new inventions in this direction have been eagerly taken up by the gas companies, who, so far as is known, have not adopted a single invention which would benefit the consumer. The London gas is highly adulterated with sulphur compounds, and is damaging to works of art and beauty. Dr. Frankland concluded by saying, it should have an illuminating power of twenty candles, below which no gas is fit for household purposes.

## LILIPUTIAN ENEMIES.

Under this title C. F. Sprague describes, in *The American Journal of Horticulture*, the various species of fungi, known as rust, smut, bunt and mildew, which are of the simplest structure. Though the individual plants are so infinitesimally small, they reproduce with such wonderful rapidity, and in such amazing profusion, as to destroy whole crops by their ravages. Their mycelium penetrates the soft tissues of their prey, and on reaching the surface breaks forth in an eruption, which allows no cure. A piece of glass, on which lie spread thousands of their spores, would exhibit to the eye a faint mist, and yet this mist will increase into a black cloud, which envelopes and destroys a field of nodding grain. Experiments of all sorts have been resorted to, to prevent the attacks of these omnipresent parasites; but their occurrençe is mainly due to atmospheric influences. Their spores are everywhere, and can be called into germination by circumstances favorable to their growth, either moisture or drouth. All fungi are more or less meteoric in occurrence. Season upon season may pass without a sign of them, and then, owing to favorable influence, often beyond our recognition, they spring broadcast into life and luxuriance. Dr. Berkeley says the surest remedy is to steep the seed grain in some solution, which at once washes off a portion of the spores, and poisons the rest. Many remedies have been proposed, as simple water, salt, lime, sulphate of copper, corrosive sublimate and arsenic. The best, perhaps, is sulphate of copper (blue vitriol) in solution, dried off with quicklime.

### CAMEO ENGRAVING.

*The London Building News* contains an interesting description, here condensed, of the art of cutting cameos, which is a species of sculpture rather than engraving. There are two kinds of cameos, one of which is of stone of different colored strata, so that the raised figure is of a different color from the ground; the other is of the conch shell. The shells are sawed into squares with saws of soft iron, similar to those used by sculptors. These squares are ground on their edges by means of a stone, so as to leave them thicker toward the center. A cement is prepared by mixing equal parts of melted Burgundy pitch and rosin; the end of a stick, six or seven inches long, is dipped into this cement, and the shell, while hot, is pressed on, and thus fastened to the stick; after cooling, the shell is ready for cutting. To produce a likeness, the best way is to cut a profile on paper, lay it on the shell, and trace it out. The best gravers—the harder the better—are alone fit for the work; and they are ground down to different shaped points, some diamond, some oval, some round, and some chisel-shaped. After the likeness or design is traced on the shell, the next step is the blocking out, which is done either by hand or with flat drills in a lathe, care being taken to leave groundwork thick enough to finish up. In engraving a head, it is usual to commence with the forehead, leaving the hair, which is one of the most difficult parts to represent, to be done last. No matter how good the features may be, if the hair is badly executed, the whole figure looks bad. Sculptured heads are the best models to study. After the design or figure is finished with the graver, the cameo is rubbed with pumice stone until the marks of the graver disappear. The beautiful polish, for which cameos are justly admired, is given by means of a stiff tooth brush and potter's clay, or whiting and water. After the polishing is completed, the cameo may be removed by warming the stick until the cement is softened.

## EXTRAORDINARY CRAB.

Em. Blanchard, in a paper read before the French Academy of Sciences, states that the Garden of Plants has just obtained possession of a gigantic crab, which is probably the largest ever known. That circumstance, however, he does not consider sufficient to warrant the conclusion that it belongs to a distinct species. Warm-blooded animals, such as mammalia and birds, cease to grow after they have attained a given age; so do those insects whose life is very short; but most animals belonging to other groups differ from the former in that respect. Reptiles, fish, crustacea and mollusks, though arrived at an adult age, continue to grow, though very slowly, indeed, but still to such a degree that certain individuals will, under favorable circumstances, attain a prodigious size if they live to an extremely advanced age. Old writers have mentioned fish, such as pike, sturgeon, &c., of such large dimensions as we have never witnessed in these species. Making the necessary allowances for occasional exaggerations, it is, nevertheless, an undeniable fact that in certain rivers, where fishing was not carried on to any great extent, old fish were occasionally caught of extraordinary size. Among crustacea, there are several instances. For many years past two American lobsters have been kept at the Garden of Plants, where they attracted attention by their enormous dimensions, and yet they proved to be of the same kind as the moderately sized one now met with in the same waters. The crab now at the museum was brought from Japan by Sleboldt. It belongs to the Inachus genus, generally represented by a very small species, and seems to be exceedingly old. Each of the front legs of this specimen measures one metre and twenty centimetres (four feet one inch). If the two front legs be stretched out in a line, the whole length from end to end is 2.60 metres (eight and a half feet). It has been asserted that in some individuals this length has been found to attain eleven feet, but no specimen of the kind has ever been seen in Europe. The same phenomenon of extraordinary growth has been observed in mollusks, especially in the muscle of the Mytilidæ family, found on the coast of Russian America, where, being rarely disturbed, it seems to increase in size indefinitely.

## *TELLURIUM.*

Dr. L. Feuchtwanger exhibited a large specimen of tellurium, extracted from gold quartz of California.

The Chairman said the elementary substance, tellurium, was classed by French chemists among the metalloids. Arsenic, also, is regarded by them as a metalloid. On the other hand, English chemists placed both these elements among the list of metals. It is evident that the specimen of tellurium before us has many of the characteristics belonging to metals.

Dr. L. Bradley said he would like to test its electrical qualities, which perhaps might assist us in deciding whether it was metallic or non-metallic.

The specimen was handed to Dr. Bradley, and he is expected to report upon its power of conducting electricity.

## STEAM PLOW.

Mr. J. K. Fisher exhibited his plan of a steam plow, the novelty of which was a combination of about twenty circular saws, intended to cut into and finely divide the soil; these are to be moved, as well as the whole plow, by steam, in a cylinder having twenty-two inches stroke and sixteen inches in diameter.

Mr. J. R. Sypher said he had seen all the steam plows brought out in the country, and the chief deficiency in all was too small a supply of steam power.

Mr. Dudley Blanchard said the difficulty with the locomotive steam plow is the great power required to carry the machine over the soft uneven soil of the field.

Mr. J. Wyatt Reid explained the English system of drawing plows by means of wire ropes extending across the field, and put in motion by stationary engines.

Dr. L. Bradley criticised Mr. Fisher's plan, and thought that even the power he proposed (over one hundred horse-power) did not seem to be as effective as two horses would be before an ordinary plow.

Mr. L. B. Page spoke of the great number of horses required to break up the soil of the Western prairies.

Mr. S. H. Maynard said that, of all the machines thus far brought out for moving the soil, he believed the Evans' Rotary Digger was by far the most efficient.

Dr. D. D. Parmelee then took the floor, and read the following paper on.

## GYPSUM, OR SULPHATE OF LIME.

$C_a O. SO_3+2 HO$. (Sp. gr. is 2.322; percentage of water, about 26.47.)

When gypsum is broken into small pieces and calcined till it is nearly anhydrous, and then ground to a powder, it is *plaster of Paris.* When this is made into a paste with a little water, it sets, and forms a hard coherent mass, which is called stucco; and has the same composition as native gypsum.

Sulphate of lime has nearly the same degree of solubility, at all temperatures, and requires more than 460 parts of cold water for solution.

It has been extensively employed as a fertilizer, in various countries, for a long time. In the United States it is applied with advantage to almost every crop. In many cases it is sown with the seed; in others, it is put into the drills or holes, along with manure, and frequently dusted over the young plants early in the spring. The mode of applying it should depend upon climate and quality of soil.

Gypsum requires, as has been already stated, 460 parts of water to dissolve it. Therefore, in dry climates, soils or seasons, it might prove of little effect, if only dusted over the tops of the young plants.

Prof. Johnson, of the Royal Agricultural Society, while referring to experiments of Prof. Körte, remarks that "it would appear that time and mode of application has more influence on its effects than might be supposed," and cites the following results and experiments on clover, at different periods in the spring, from the same field:

| | |
|---|---|
| Undressed | 100 pounds. |
| Top dressed, 30th March | 132 do |
| Top dressed, 13th April | 140 do |
| Top dressed, 27th April | 156 do |

The conclusion, therefore, was that the effects of the top dressing was greatest when it is applied after the leaves have been well developed.

An explanation of the action of the sulphates of lime, potash, soda and magnesia may be deduced from chemical analysis of the ashes of plants and agricultural experiments.

By the former, it is found that sulphur is a constant constituent of gluten, albumen and other proteine compounds. Every one hundred pounds of these contain one-half to two pounds of sulphur, which must be obtained from the soil. The sulphates named easily yield to the growing plant this required sulphur. In this connection, it may be remarked that Peschiér observed that gypsum laid on the leaves of plants is gradually converted into carbonate of lime.

It has also been observed that sulphuric acid, in a very diluted state, has precisely the same effects upon crops as that observed when sulphate of lime or sulphate of soda is used.

The effects which the foregoing sulphates exert upon plants depend upon their relative solubility in water, by means of which they can enter into the roots. An imperial gallon of pure water, at the ordinary temperature, will dissolve, of

| | | |
|---|---|---|
| Gypsum (burned), about | 0 1-6 | pounds. |
| Gypsum (unburned), about | 0 1-4 | do |
| Sulphate of potash, about | 1 1-2 | do |
| Sulphate of soda, about | 1 1 2 | do |
| Sulphate of soda, crystalized | 3 1-2 | do |
| Sulphate of magnesia | 4 | do |

Gypsum is the cheapest, and, in moist climates, most economical, since it is sufficiently soluble to afford the plant as much as it might require. In dry seasons the use of sulphate of soda and magnesia is recommended.

The chemical composition of the soil determines in a greater degree, however, the nature and extent of their chemical action. If either potash, soda, magnesia or lime already abounds in the soil, the good effects of the sulphate may depend entirely on the sulphuric acid. If the land is deficient in lime, then the gypsum will act in virtue of its sulphuric acid not only, but also of its lime. Its effects will, therefore, be more marked than when the soil is naturally calcareous, or artificially made so. The same will be true of the other sulphates.

Those sulphates, therefore, should be chosen, the base of which the soil, to which they are to be applied, is most deficient; and it may be that two or more combined are required. The composition of the crops to which they are applied should also be taken into consideration.

The differences in the relative proportions of the ingredients present in their ash, will be seen from the following table:

| | Potash and Soda. | Lime. | Magnesia. | Phosphoric Acid. | Sulphuric Acid. | Silica. |
|---|---|---|---|---|---|---|
| Wheat | 33 | 3 | 12 | 50 | 0.25 | 1 |
| Barley | 22 | 3 | 7 | 39 | 0.10 | 27 |
| Oats | 26 | 6 | 10 | 44 | 11 | 3 |
| Rye | 34 | 5 | 10 | 50 | 1 | 0.4 |
| Indian corn | 33 | 1 | 16 | 45 | 3 | 1 |
| Rice | 30 | 1 | 12 | 53 | ......... | 3 |
| Beans | 44 | 6 | 8 | 38 | 1 | 1 |
| Peas | 44 | 5 | 8 | 33 | 4 | 0.51 |
| Wheat straw | 13 | 7 | 4 | 3 | 6 | 65 |
| Barley straw | 7 | 10 | 3 | 3 | 2 | 71 |
| Oat straw | 29 | 8 | 4 | 3 | 3 | 48 |
| Rye straw | 18 | 9 | 2 | 4 | 1 | 65 |
| Maize straw | 35 | 8 | 7 | 17 | ......... | 28 |
| Rice straw | 14 | ........ | 5 | 1 | 4 | 74 |
| Bean straw | 55 | 20 | 7 | 7 | 1 | 7 |
| Pea straw | 5 | 55 | 7 | 5 | 7 | 20 |
| Red clover | 36 | 33 | 8 | 8 | 3 | 7 |
| Potatoes | 57 | 2 | 5 | 13 | 14 | 4 |
| Turnips | 47 | 14 | 5 | 8 | 14 | 8 |
| Beets | 56 | 9 | 5 | 8 | 2 | 10 |
| Cabbage | 32 | 21 | 6 | 12 | 22 | 0.74 |
| Potato tops | 44 | 17 | 7 | 8 | 7 | 4 |
| Turnip tops | 34 | 23 | 3 | 9 | 13 | 1 |

It appears that some plants constantly demand more lime, others more magnesia. The effect of the sulphate employed, therefore, depends conjointly upon the composition of the soil, the plants to which they are applied, and the manner of their application; also much upon the moisture of the soil and the dryness of the season.

Liebig says, in Organic Chemistry applied to Agriculture, p. 86, that "the striking fertility of a meadow on which gypsum has been strewed, depends only on its fixing in the soil the ammonia of the atmosphere, which would otherwise be volatilized with the water which evaporates."

The specific action of gypsum has since been studied in detail by the peers of Prof. Liebig, and his theory, I think, is generally considered as unsatisfactory.

Johnson, in his Lectures on Agricultural Chemistry and Geology, page 83, says: Supposing the gypsum to meet with a sufficient supply of ammonia in the soil, and that it exercises its full influence, one hundred pounds of common *unburnt* gypsum will fix or form sulphate, with nearly twenty pounds of ammonia, containing sixteen and a half pounds of nitrogen. One hundred weight, therefore (one hundred and twelve pounds), of gypsum will form as much sulphate of ammonia as will contain twenty-two and a half pounds of ammonia, and if introduced without loss into the interior of plants, this sulphate will furnish them with eighteen and a half pounds of nitrogen.

In the first volume of the British Husbandry, pages 322, 323, the following experiment is recorded:

Mr. Smith, of Tunstal, top-dressed one portion of a field of red clover with powdered gypsum, at the rate of five bushels (or four hundred weight) per acre, and compared the produce with another portion of the same field, to which no manure had been applied. The first crop was cut for hay, and the second ripened for seed. The following were the comparative results per acre:

| | Hay crop. | Seed. | | Straw. | | |
|---|---|---|---|---|---|---|
| | *cwt.* | *qrs.* | *lbs.* | *cwt.* | *qrs.* | *lbs.* |
| Gypsumed ................ | 60 | 3 | 21 | 22 | 3 | 12 |
| Unmanured ................ | 20 | 0 | 20 | 5 | 0 | 0 |
| Excess of produce........ | 40 | 3 | 1 | 17 | 3 | 12 |

The excess of produce in all the crops upon the gypsumed land is very large. By the result of Boussingault's analysis, dry clover seed contains seven per cent, and the hay of red clover one and a half per cent of nitrogen.

The seed, as it was weighed by Mr. Smith, would still contain one-ninth its weight of water, and consequently only six and a third per cent of nitrogen.

Let it be taken at six per cent, and let the *straw* be supposed to contain only one per cent of nitrogen—the quantity of this element being found to diminish in the granes after the seed has ripened, and to average one per cent in the straw of wheat, oats and barley—the weight of nitrogen reaped in the whole crop would then be as follows:

| | |
|---|---|
| Forty hundred weight hay (4,480 pounds), at one and a half per cent of nitrogen, contain...................... | 67 pounds. |
| Eighty-five pounds seed, at six per cent, contain.......... | 5 do |
| Seventeen hundred weight, three quarters, twelve pounds (2,000 pounds) straw, at one per cent.................. | 20 do |
| Total nitrogen in excess of crop...................... | 92 do |

But, as above shown, the five bushels or four hundred weight of gypsum could fix only ninety pounds of ammonia, containing seventy-four pounds of nitrogen, *leaving, therefore, eighteen pounds, or one-fifth of the whole to be derived from some other source.*

Now, this result supposes that none of the gypsum or sulphate of ammonia was carried away by the rains, but that the whole remained in the soil, and produced its greatest possible effect on the clover, and all in one season. But the effect of the gypsum does not disappear with the crop to which it is actually applied. Its beneficial action is extended to the succeeding crop of wheat, and on grass lands the amelioration is visible for a succession of years. If, then, the increased produce of a single year may contain more nitrogen than the gypsum can be supposed to yield, this substance must exercise some other influence over vegetation than is involved in its supposed action on the indefinite quantity of ammonia in the atmosphere.

Again, Mr. Barnard, of Little Bordeau, Hants, applied two and a half hundred weight per acre on two-year old sainfond, on a clayey soil. The increased produce of the first cutting was a ton per acre; and of the second, in October, fully a ton—the undressed part yielding scarcely any hay at all, while the dressed part yielded one and a quarter tons. The second year no gypsum was applied, and the difference is said to be at least as great.

Supposing the increased produce in all to have been four tons of hay, and the nitrogen it contained to have been only one per cent, the four tons (8,960 pounds) would contain about ninety pounds of nitrogen. But two and a half hundred weight would fix only forty-six pounds of nitrogen in the form of ammonia; and, therefore, supposing it to have produced its maximum effect, *there remain forty-four pounds, or nearly one-half of the whole unaccounted for by the theory.*

A discussion followed the reading of Dr. Parmelee's paper, in which several gentlemen advocated the views of Liebig, Johnson and others as to the action of gypsum as a fertilizer; after which the Association adjourned.

## May 23, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Esq., Secretary.

The Chairman presented the following notes on progress in science and art:

### ALUMINUM ALLOY IN DENTISTRY.

A process for casting an aluminum alloy has been invented which will furnish a very light foundation for artificial teeth, not affected like gold, by sulphur compounds.

### FISH FROM ARTESIAN WELLS.

Sir Charles Lyell, in a new edition of his "Principles of Geology," notices the discovery of fish in some of the artesian wells sunk in the desert of Sahara. They were brought from the depth of one hundred and seventy-five feet, and were not blind like those of Adelsburgh, but had perfect eyes.

### NEW SULPHIDE OF CARBON.

Loew describes a new compound, containing four atoms of carbon and one of sulphur, obtained by action of phosphoric persulphide upon acetic acid. It is insoluble in carbonic bisulphide, but dissolves in concentrated sulphuric acid, and the solution has a red color. The new name expressing the atomic constitutents of this new body is *oras*.

### PROPAGATION OF CONCUSSION THROUGH GAS.

M. Le Roux, of France, has made experiments to ascertain the rate at which a concussion is sent through a gaseous mass inclosed in a tube, and maintained as near as possible at a uniform temperature. From seventy-seven determinations, he concludes that the propagation is at the rate of 330.66 meters per second, with a probable variation of one-sixteen hundredth of a second.

### LACTOSE.

Dr. Fudaskowski, of Würtemberg, has separated pure sugar of milk into two sugars by treating it with dilute sulphuric acid (*thelasot*). Both are capable of fermentation, and both turn the plane of polarization to the right. The one described by Pasteur, crystallizes in hexagonal prisms and ferments more rapidly than the other, which crystallizes in right prisms, and has a less sweet taste.

### PICRIC ACID IN A GALVANIC BATTERY.

M. Duchemin, in a paper read before the French Academy of sciences, stated, that he had replaced the nitric acid in the porous cell of a Bunson pile with a few grammes of picric acid, whereby the evolution of noxious vapors is effectually got rid of. The addition of a few drops of sulphuric acid to the picric acid, will considerably increase the intensity of the current.

### SALMON IN AUSTRALIAN RIVERS.

Several years ago, the ova of salmon were sent out in ice, at great expense, from England, and were deposited in ponds near the river Plenty, a branch of the Derwent, and when old enough were set free in the river. Great fears were entertained of the result, but the fish, after escaping from their natural enemies in the sea, are returning to the Derwent, and the question of their acclimation appears to be settled.

### OXYGENATED WATER.

Recent experiments by Schönbein prove that water, united to one atom of oxygen gas, is a more stable body than was previously supposed. He ascertained, that oxygenated water (*elt*) is really weakened by boiling, but that, nevertheless, when properly diluted, it is not wholly destroyed; so much is this the case, that it may even be concentrated by this means, and that generally the more it is diluted with water the better resists the action of heat. As to that which represents the deficit, it is not, as might be supposed, destroyed; it goes forth with the vapor, and condenses with it so that oxygenated water is afterward found in the receiver. As metallic vessels exercise a decided decomposing action on oxygenated water, glass or porcelain should be used in making similar experiments.

### THE CAUSE OF CHOLERA.

In a memoir addressed to the Paris Academy of Medicine, M. Daumé announces the discovery of a cholera animalcule. The memoir has been referred to the committee having charge of the Bréam prize, to be awarded to the person who discovers a cure for the modern pestilence. It is possible that Asiatic cholera may be caused by the presence of an organism, but, from the rapidity of the progress of this disease, it seems more reasonable to infer that this organism belongs to the vegetable class, resembling minute mycelium, which often increase with most fearful rapidity. Still, we are without proof to show that inorganic matter cannot assume such baneful form, by the process of diffusion through common air, as to carry into the lungs a poison which may soon disintegrate the blood and paralyze the nervous system. It has, fortunately, been clearly demonstrated that the progress of this unknown enemy through its favorite haunts—the cities—can be prevented by cleanliness, the use of disinfectants, and strict observance of sanitary regulations.

## SUGAR FROM THE JERUSALEM ARTICHOKE.

M. Dubrunfant has sent a paper to the French Academy of Sciences on the presence and formation of sugar in the Jerusalem artichoke (*helianthus tuberosas*). When gathered in September, this tubercle yields a juice which, in the saccharometer, produces a left-hand rotation of the polarized ray; in contact with yeast, it undergoes a regular alcoholic fermentation, and then deposits a precipitate which is inulin, and the mother ley which remains is optically neutral. If the tubercle be gathered in March or April, its juice produces a right-hand rotation of the polarized ray; it does not precipitate inulin, and, on being concentrated and treated with alcohol, yields a solution and a gummy precipitate soluble in water and neutral in the saccharometer. The alcoholic solution, on the contrary, still gives right-hand rotation of the polarized ray, and, if reduced to a syrup and treated with baryta, precipitates an insoluble sucrate, which, when treated with carbonic anhydride, will dissolve and deposit crystals of pure cane sugar.

## RELATIVE VALUE OF MANURES.

M. A. Cavalier, of Somme, France, has made experiments with several artificial fertilizers. On ground exhausted by four successive crops, he obtained, without manure, nineteen hectolitres of wheat per hectare, instead of twenty-eight, the average yield. He proposed to raise on this land beet roots on six plots of ground containing one *are* each, and separated from each other by a deep furrow. The fertilizer applied to the first plot consisted of five kilogrammes of sulphate of ammonia, two of phosphate of lime, two of common potash and two of lime; to the second plot were added all the ingredients used on the first, except the lime; to the third, five kilogrammes of sulphate of ammonia, two of phosphate of lime, two of lime, but no potash; to the fourth, two kilogrammes of lime, two of potash, but no nitrogen, to the fifth, five kilogrammes of sulphate of ammonia, two of carbonate of potash, two of lime, but no phosphate of lime; to the sixth, no manure. The return per hectare (nearly two and a half acres) was:

| | | | |
|---|---|---|---|
| On first piece | 51.000 | tons per hectare. | |
| On second piece | 47.445 | do | do |
| On third piece | 25.034 | do | do |
| On fourth piece | 36.834 | do | do |
| On fifth piece | 37.881 | do | do |
| On sixth piece | 25.550 | do | do |

The increase of the first on the sixth was twenty-five and a half tons, or just double. Beet root being sold at twenty francs per ton, and artificial fertilizers at three hundred and ninety-five francs per hectare, the profit was one hundred and fifteen francs by using the fertilizer

## SPOTS ON THE SUN.

Mr. Balfour Stewart, in a lecture before the Royal Institution, London, on the sun as a variable star, expressed the opinion that the spots on the sun's surface are produced by downward currents of the surrounding atmosphere, the depth of which had been estimated at not less than 72,000 miles. A downward rush of atmosphere occasioned an exposure of the body of the sun, and produced an appearance of a dark spot; an upward rush of the atmosphere produced the bright feculæ that surround the dark spots, and are seen more conspicuously on the borders of the sun's disc. This atmosphere, he thought, was very sensitive to the approach of the planets, especially of Venus, in consequence of its comparatively short distance, and of Jupiter, in consequence of its size. When Venus is opposite to the earth, the spots attain their maximum, which is sometimes as much as 15,000 miles in diameter. From these spots we estimate that the sun. rotates on its axis once in about twenty-five days; but there is reason to believe that the spots rotate faster than the body of the sun, owing to the more rapid rotation of the upper portions of the atmosphere, which, on being carried nearer to the center by a downward current, retains the velocity it before possessed, in the same manner as the Trade winds on the earth are supposed to be caused by the different velocities of the air near the poles and in the equatorial regions. In addition to the influencing causes attributable to the movements of the planets, there are periodical variations of the spots occurring about every ten years, which cannot thus be accounted for.

The lecturer spoke of the corona observed during the last total eclipse of the sun, which he attributed to its atmosphere, and it was on calculations founded on those appearances that the height of the sun's atmosphere had been conjectured.

### CONVERSION OF DYNAMICAL INTO ELECTRICAL FORCE.

W. and C. W. Siemens, of England, have modified the machine invented by Mr. Wilde, by substituting electro-magnets for the permanent or steel magnets in the primary magneto-electric part of the apparatus. The electro-magnets are first charged by a galvanic battery or other rheomotor; after the armature begins to rotate, the battery is removed, and without its aid the magnetic force continues to accumulate. It is not essential even to use the battery, for the soft iron in the core of the electro-magnet may be charged by contact with a permanent magnet, to be removed after the armature is in motion.

Wheatstone has also constructed an apparatus in which the wires covering the electro-magnets are connected with those surrounding the armature by which the current, while moving in the same direction, is made to act upon the electro-magnet so as to increase its polarity; the residual magnetism of the iron—the primary cause of the current—increases until it reaches its maximum. To produce this increase of the intensity of the induced current, there must be a vast augmentation of the force required to turn the armature.

M. G. Farmer, of Salem, Mass., has made similar and more interesting modifications of the original machine, and in a letter to Mr. Wilde, the inventor, he states that he has obtained an increase of thirty per cent in the power of the magneto-electric machine, by transmitting the current from the armature through the coils of wire surrounding the pieces of soft iron, forming the prolonged extremities of the permanent magnets of the machine. He constructed, also, a small machine, in which a current from a thermo-battery excites the electro-magnet of the Wilde machine to start it, and, after the machine is in action, a branch from the current of the magnets passes through its own electro-magnet, and thus supplies the magnetism required. It is not exactly like a person standing in a basket and trying to lift himself, because the electricity proceeds from a conversion of mechanical energy which must be continually supplied. Neither can it be in anywise likened to the various schemes for producing perpetual motion; but it depends on the principle that the actual energy of mechanical force, conjointly with the potential energy of the magnet, can develop a greater amount of potential energy than is originally resident in the magnet; in other words, it is a method of converting a part of the actual energy of the prime mover into the potential energy of magnetism.

## *TIN-LINED LEAD PIPE.*

The Chairman said he had lately visited the works of Messrs. Colwell, Shaw & Willard, manufacturers of the tin-lined lead pipe, and, in company with many well-known engineers and scientific gentlemen, had witnessed a series of experiments made with ordinary lead pipe, and with tin-lined lead pipe, to ascertain the internal pressure at which each would give way. Five sections of each kind of pipe were tested by hydraulic pressure. The result of these experiments may be briefly stated: It was found that tin-lined pipe of a given weight stood about one-seventh more pressure than pure lead pipe of the same internal diameter and of twice the weight.

An interesting discussion followed, on the effects of using lead pipe. It was stated that almost every young man in a certain village in Connecticut, had the rheumatism, while, in a neighboring village, this disease was not prevalent. This difference was accounted for by the fact that, in the first-named village the water used all came through lead pipe.

Dr. J. W. Richards expressed the belief that the use of lead pipe to convey some drinking waters, would produce such an effect.

Dr. J. E. Snodgrass spoke of the evils which result from using Croton water, after passing through long lengths of lead pipe.

Prof. Vanderweyde said, all constitutions are not affected alike; many would not experience any bad effects from using water drawn from lead pipes. Plumbers, in repairing the lead tanks used in oil of vitriol factories, generally feel the effects of lead poison. He had tested the water from the lead-lined tank which supplies the Cooper Union, and had not been able to detect any traces of lead.

Dr. D. D. Parmelee remarked, that he had noticed, last summer, that at one place in Poughkeepsie, ale was drawn through forty feet of lead pipe. He thought such ale, at least, must be the source of much evil.

Prof. Vanderweyde said lead pipe, through which oil is drawn, lasts but three or four years. The question is, where does all the lead go to?

It was suggested that experiments be made by some of the chemists of this Association, regarding the action of Croton water on lead pipe, and reported at a future meeting. Adjourned.

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## May 30, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Esq., Secretary.

The following items of scientific news were read by the Chairman:

### VANADIUM.

Mr. Mushet has expressed the opinion that a minute quantity of the metal vanadium mixed with iron forms a valuable alloy, and gives a fine, tough, fibrous texture to bar iron.

### ANCIENT WATER.

Excavations lately made at Pompeii revealed a bronzed vase, hermetically closed, and covered with a thick incrustation. The interior was found to contain a liquid; it proved to be clear, soft water, which has not changed by evaporation for 1,800 years.

### THE ELECTRIC TELEGRAPH IN JAPAN.

Arrangements have been made to lay a submarine cable between Yokohama and Yeddo; land lines into the interior, as well as cables to other islands, doubtless will soon follow.

### CARILLONS.

A specimen of a chime of Belgian bells is to be exhibited at Champ de Mars, Paris, previous to being placed in the tower of Saint Germain l'Auxerrois. Four years have been spent in making this carillon, which is composed of forty-two bells, all of which, by means of keys, are under the control of one player.

### GLYCERINE FOR MERCURY GAUGES.

The fouling of mercury gauges, used in connection with pressure tests, may be prevented by introducing a few drops of glycerine in the tube on the top of the mercury. The glycerine, by its superior adhesion, lubricates the glass, and keeps the mercury from contact with it.

### A NEW VOLCANO.

Following an earthquake, a volcano burst, several months ago, in the South Pacific ocean, near the Friendly islands. Great quantities of lava have been discharged, and a dense smoke rises higher than the neighboring island of Orosenga or Oloosinger—one of the Navigator's group—which is about 2,000 feet high.

### CREOSOTED TIMBER.

A creosoted sleeper, put down on the Stockton and Darlington railway, in England, in August, 1841, was taken up March 14, 1867, after nearly twenty-five years' service. The grain of the wood, although slightly discolored by creosote, is as fresh, and apparently as tough as that of newly sawed timber, and the odor of creosote is as strong as if the wood had just been operated upon.

Mr. J. W. Reid remarked, after the reading of this item, that creosoted timber costs ninety cents a tie.

### A MOUNTAIN RAILWAY.

There is a project on foot to construct a railway from Vera Cruz to the city of Mexico. In a distance of one hundred and fifty miles, the elevation to be reached is 8,400 feet. This height exceeds that attained on any other road yet made. The Baltimore and Ohio railroad reaches an elevation of 2,626 feet. The height of the Sœmmering incline is 2,887 feet, and the intended summit of the Mount Cenis railway will be 5,815 feet above its lowest grade.

### POLYMERS OF ACETYLENE.

Berthelot has found that when acetylene—a compound consisting of two atoms of carbon and two of hydrogen, according to the new notation (*erl*)—heated to a temperature near that at which glass melts, is gradually converted into a series of polymeric bodies, identical with certain well known hydrocarbons. Thus, triacetylene is benzol (*earl*); tetracetylene is styrol (*eirl*); the highest product yet obtained is retene, equal to nine of acetylene (*yeirl*).

### VIENNESE MEERSCHAUM.

M. Holdmann states that the artificial product known as Viennese meerschaum is prepared by mixing one hundred parts of silicate of soda, at thirty-five degrees, with sixty parts of carbonate of magnesia and eighty parts of the native meerschaum—a silicate of magnesia—or with pure alumina. This mixture is then pulverized with the greatest care, and passed through a seive of very fine silk or horse hair; add water, and boil for ten minutes; then pour the whole into moulds, placed so that the water may easily separate.

### A DISCHARGE FOR ANILINE COLORS.

A process important to printers using aniline colors has been devised by Dangeville and Gutin. They substitute for the powdered zinc, now generally used, a solution of permanganate of potash in a slight excesss of dilute sulphuric acid, thickened with kaolin, pipe clay, or gelatinous silicate. With this they print; oxidation takes place; and the fabric is nearly colorless. The small portion of oxide of manganese remaining is readily removed by a weak bath of sulphurous acid.

### HYPOCHLORITE OF MAGNESIA IN BLEACHING.

We have previously noticed the use of hypochlorite of magnesia in place of hypochlorite of lime for bleaching purposes. The principal advantage of the process is that the liberated magnesia does not act on the tissue to be bleached. The best way of preparing the hypochlorite of magnesia is to decompose sulphate of magnesia with hypochlorite of lime. When the sulphate of magnesia contains manganese, the liquid assumes a red color, and loses its bleaching power.

Mr. Reid said that bleaching under a pressure of one hundred and sixty pounds per square inch has been found to be very successful. It is calculated that Messrs. Sprague & Co., extensive cotton manufacturers, of Rhode Island, will effect a saving of $200,000 per annum by this improvement, in which the bleaching is completed in six hours.

### OXIDATION BY MEANS OF CHARCOAL.

A communication was lately read at the London Chemical Society concerning experiments made with recently burned boxwood charcoal. It was first placed in pure oxygen gas, and, after being saturated, into other gases and vapors, and the absorption, as well as the resulting products, were noted. Moist sulphurous acid and sulphuretted hydrogen were changed to sulphuric acid; common alcohol to acetic acid; amylic alcohol to valerianic acid; but the author asserted that ammonia does not undergo oxidation in the pores of charcoal.

### THE SILKWORM IN AUSTRIA.

M. de Bretton, a sericulturist, states, that the Chinese silkworm has become perfectly acclimatized in Austria, and it is now in its fourth generation there as well as in France. Last year he obtained 4,000 cocoons of this species, which yielded nearly 300,000 eggs, This year he is organizing, with aid of the Austrian government, three large silk-producing establishments in Moravia and Slavonia. Thus far, the Chinese silkworms have enjoyed the best of health in Austria. The silk hitherto obtained is of the best quality. Specimens of it are now to be seen at the Paris Exposition.

### COMPRESSED GUN COTTON.

This article is manufactured for mining purposes, by first making the cotton explosive in the usual way; this is placed in a pulping machine, and reduced completely to pulp. It is then compressed by hydraulic machinery, so that one inch length of charge of any given diamater, is equal in explosive force to six inches of gunpowder filling the same bore. The cotton could not be put into a more portable form, and by bringing the charge nearer the bottom of the hole, it is apparent that its use will considerably lessen the labor of drilling, for the drill-hole need not be so deep as when gunpowder is employed.

Mr. S. H. Maynard said, Col. T. V. Shaffner had invented a gun-cotton which consisted of three kinds, exploding at different times, quick, quicker, quickest, which had been found very effective.

### THE THAMES EMBANKMENT.

The great work of sewerage in London is progressing very satisfactorily. The chief engineer of the Metropolitan Board of Works reported, at the first meeting in April last, that, as regarded that portion of the northern embankment between Westminster and Waterloo bridges, 3,216 feet of the low level sewer, 2,477 feet of subway, 2,925 feet of small drains, and 320 feet of Westminster steamboat pier had been constructed.

### NEW PORCELAIN GLAZE.

Messrs. Anthoin & Gonourd have produced singularly beautiful effects by a new glaze. It is made by dissolving platinum and aluminum together in *aqua regia.* The double chloride of the two metals is then mixed with finely-ground Limoges glaze, which is a potash-alumina glass prepared from pure pegmatite, graphic granite, a quartz of feldspar rock. This mixture is applied to the porcelain in the ordinary way. In the glazing oven some peculiar changes take place by means of heat and the reducing action of the oven gases, the result being a glaze of remarkable metallic luster, exhibiting beautiful rainbow colors.

### BISMUTH AND PHOSPHORIC ACID.

When a piece of bismuth is thrown into a solution of glacial phosphoric acid, the metal fuses to a bright globule, from which small flames appear. This action is sometimes so strong, that particles of incandescent bismuth are thrown out of the vessel, thus forming a shower of sparks. The flames which appear, evidently arise from the phosphate of bismuth which would be formed, and which is decomposed by its release of phosphorus, or forming phosphretted hydrogen in contact with the water of the constitution of the phosphoric hydrate. Eventually there remains a spongy mass of bismuth, as well as a white powder, which is phosphate of bismuth.

### ELECTRIC LIGHT FOR SHIPS.

The electric light has been used on the French yacht, Jerome Napoleon, for the purpose of ascertaining whether it will materially aid in avoiding collisions at sea. Beside the ordinary reflecting apparatus, it is proposed to try the light condensers, first used by M. Louis d'Henry in solving the following problem: "Being given a luminous point to contrive an apparatus which receives on its surface all the light emanating from that point, and directs it toward a position in space." The apparatus to be used on the yacht, consists of an ellipsoid of revolution, by means of which the light placed in one of the foci undergoes three reflections, and is projected sixteen times more intense than the direct pencil of rays.

Prof. Vanderweyde said, the electric light was first used in this country, and on the Collins line of steamships about ten years ago. The magnets required to produce this light were revolved by a small engine of six horse power; but the experiment was not regarded as satisfactory.

### SEPARATION OF NAPHTHALINE.

*Dingler's Journal* describes a mode of effecting more perfectly the sublimation of naphthaline, a substance which clogs up gas pipes, and has thus far brought little profit to gas makers. The crude product, consisting of small brown crystals with tarry matter, is thoroughly mixed with twice its volume of fine quartz sand. This mixture is placed over a water bath in a layer about four inches deep, and covered with a cloth. Above the whole is a light box, made either of wood or paper, in which the volatile product is condensed. Under one hundred degrees C, naphthaline slowly volatilizes, and when brought again to the solid state, it is found to be quite free from impurities. The residue is a hard solid, for which uses have already been found.

### EFFECTS OF LIGHTNING.

Emile Duchemin, lately communicated to the French Academy important observations on a thunderbolt which struck the lighthouse at Fécamp. The gigantic electric spark passed through the tower, breaking everything in its course, even as far as the marble pavement, which it smashed before entering the earth. The tower was provided with a lightning conductor, but, on examination, it was found that it was carried down into a small cistern hollowed out of the chalk, and lined with Portland cement. It may be useful here to repeat the conditions necessary for safety.

1. The points of the conductors must be sharp.
2. The conductor must be of proper proportions, and without a break in its entire length.
3. When not terminated in a well, the conductor must be carried down to a point where the ground is constantly moist.

### GREAT STONE ARCH.

The bridge used for carrying the Washington aqueduct across Cabin John creek, is a stone arch of greater span than any other in existence, being 220 feet, or twenty feet longer than that of the Grosvenor bridge at Chester, England. The intrados of the arch is struck with a radius of 134.2852 feet, while the radius of the extrados is 143.2695 feet. The depth of the voussoirs, or arch-stones, is six feet two inches at the springings, and four feet two inches at the crown. Outside the voussoirs is another series of arch-stones, which make the total thickness of the arch at the springings twenty feet four inches. The rise of the arch is 57.2624 feet. The abutments are formed of the solid rock on each side of the creek. This rock is stepped down, and the steps are filled with concrete, on which are the footings of the arch-bed. The haunches and abutments are lightened by relieving arches—four on the eastern side of the creek, and five on the western, extending through half the thickness of the bridge. In mid-winter the key-stone was inserted, and it was noticed afterward that a rise of temperature lifted the arch from the centering, which was not removed until nearly a year later. The width of the bridge on the face of the arch is twenty feet four inches. The circular water-channel is nine feet in diameter. The bridge was designed by Gen. M. C. Meigs, engineer-in-chief of the Washington aqueduct. This aqueduct brings the water of the Potomac river over sixteen miles, and is capable of supplying one hundred million gallons per day.

### FRENCH METHOD OF PRESERVING MEAT.

François Cerio, of Turin, exhibited at the Paris Exposition an apparatus for preserving all flesh and other kinds of food usually treated by salt or saltpetre. It consists of an air-tight receiver, which has two stop-cocks and pipes, one connected with an air-pump used for producing a vacuum in the receiver, and the other with a vessel containing a solution of common salt; with the addition of from two to five per cent of nitrate of potash (saltpetre), if meat of a high color is required. After the meat is placed in the receiver, and the cover is fitted air-tight, the passage connecting with the air-pump is opened, and the air is exhausted, if possible, down to five millimetres pressure. The passage is then closed, and the other stop-cock is opened, allowing the brine to overflow the meat for a few minutes, when the meat is removed and hung up to drain and dry, and in a place where it can receive fresh currents of air. After a few days it will be fit to be packed in a case and sent any distance. In this operation the meat subjected to an approximate vacuum swells up to about one-third more than its original bulk, and, in consequence of this wide opening of the pores, the brine is rapidly absorbed, and in such quantities as to insure the preservation of the substance, if not indefinitely, at least until it could be transported to very distant places. By this process the fibrin, albumen, creatine and other nutritive qualities are preserved, and the interior of the meat retains its original color, odor and taste, and when cooked the trace of the salt is so slight that it may be substituted without objection for the meat of recently-killed animals. The principal advantages claimed in the process are the rapidity and certainty of complete preservation, and the saving of about eighty per cent of the salt and saltpetre usually applied.

An interesting discussion followed the reading of the last item.

Dr. Rowell said he believed it was not true. Dr. Lardner tried the plan many years ago, and the meat spoiled in three days.

Mr. S. H. Maynard said the same thing had been done long since in this country, and the preserved meats by a similar process had been shown at the American Institute.

Mr. Overton remarked that large quantities of beef had been successfully prepared in this way for Northern markets.

Prof. Vanderweyde observed that the chloride of zinc was used.

Mr. T. D. Stetson said the great difficulty in any preserving process was to get all the particles in direct contact with the antiseptic. Much less salt was required in cold weather than in warm to effect preservation of fish.

## *WATER METER.*

Mr. James Cochrane exhibited his water meter, which is an improvement on that shown by him some years ago, at the fair of the American Institute. The improvement consists in aerating the water as it is delivered from the meter, so as to make it more palatable.

Dr. D. D. Parmelee said, in this plan, the aeration is done in the lowest part of the house, where the meter is placed, and where the air is very impure.

Dr. Edwards spoke of the great care used in London to prevent the wasting of water. As a general rule, each house has a cistern, which is supplied with water every two weeks. The remarks of the Doctor showed the great need of new aqueducts for the supply of London.

Dr. Parmelee said that the effect on Croton water remaining in common lead pipe for twenty-four hours, would be shown at the next meeting.

## *TELLURIUM, A METAL.*

Dr. L. Bradley, of Jersey City, to whom was handed the specimens of tellurium exhibited at the Polytechnic, by Dr. Feuchtwanger, said: I have tested the power of tellurium for conducting electricity, by comparing it with several other substances. I procured pieces of about the same dimensions [half-inch square by three-fourths of an inch long] of zinc, magnesium, cast iron graphite, several pieces of coke, black oxide of manganese, sulphuret of antimony, and sulphur; also, an appliance for conveniently connecting them, one at a time, into a circuit of short coarse wire, designed to conduct a current of electricity generated by four cups of Hill's battery. The battery being arranged as a compound battery, *i. e.*, the positive pole of one cup connected with the negative of the next, and so on, and using the tangent galvanometer for intensity, I used the following deflections, viz:

| | |
|---|---|
| With no substance | 80° |
| With tellurium | 80° |
| With zinc | 80° |
| With manganese | 80° |
| With cast iron | 80° |
| With graphite | 79° 5′ |
| With coke | 79° 20′ to 80° |
| With manganese | 19° 20′ |
| With sulphuret of antimony | 0° |
| With sulphur | 0° |

With the cups arranged as simple, or quantity battery—*i. e.*, the positive poles connected, and the negative poles connected—the deflections were:

| | Quantity galv. | Intensity galv. |
|---|---|---|
| With no substance | 28° 20′ | 62° |
| With tellurium | 26° 50′ | 62° |
| With zinc | 27° 40′ | 62° |
| With magnesium | 27° | 62° |
| With cast iron | 27° | 62° |
| With graphite | 15° 10′ | 61° |
| With coke | 20° to 27° | 61° 10′ to 62° |
| With manganese | 0 | 0 |
| With sulphuret of antimony | 0 | 0 |
| With sulphur | 0 | 0 |

This shows how little capable a quantity current is of overcoming resistance; for even the manganese, which, under the intensity current, admitted a deflection of nineteen degrees and twenty minutes, under this, seemed like a perfect insulator, even by the very sensitive quantity galvanometer.

Tellurium heats readily, though not quite so rapidly as zinc, and it cools a little more slowly.

It is not to be expected that, with pieces so small, and with so weak a battery, very nice and exact results are to be attained; but the foregoing are sufficient to show that tellurium is a good conductor of both heat and electricity; and we see that it possesses a brilliant metallic luster.

The question arises, therefore, why is it that chemists, especially those of France, have recently ranked it among the non-metallic substances?

Metallic luster and conducting power have always been looked to as the distinguishing characteristics of metals. Kane says: "By the combination of these two characters—luster and conducting power—the metallic or non-metallic nature of a body is always distinguished."

It is true, that tellurium is not malleable nor ductile, as are many of the metals; neither is bismuth or antimony. Like the non-metallic substances, it unites with *oxygen* to form acid. So do antimony, arsenicum, gold, chromium, manganese, and many other metals. With *hydrogen* it unites, forming a hydruret; so do potassium, arsenicum and antimony. In short, it possesses the universally admitted distinguishing characteristics of metals; and nothing, either in physical character or chemical behavior, which it does not hold in common with some other metals. I must therefore call it a metal.

Mr. H. F. Walling read the following paper, which was illustrated by experiments:

## *WIRBEL-BEWEGUNG, OR WHIRLING MOTION.*

It will be remembered that in the paper on Molecular Motions, which I read before you last winter, I took the position that atoms have, *per se*, no such properties as hardness, solidity, rigidity, impenetrability, elasticity, etc., all of which I suppose to be manifestations of attendant force.

I now wish to call your attention to a recent hypothesis, emanating from a high source in Europe, and having one feature of similarity with mine, in that it diminishes the number of assumed properties which are attributed to matter.

Helmholtz, the celebrated German physicist and mathematician, has recently investigated the dynamical properties of *vortex rings*, and has arrived at some curious conclusions in regard to them. He finds that the characteristic motion of these rings, to which he gives the name "wirbel-bewegung," or whirling motion, would, if once set up in a perfect fluid, continue forever. A "perfect fluid" is one in which there is no viscosity or friction of the particles against each other; no resistance to motion except that of inertia. Of course, it would be just as impossible to originate such a motion as to destroy it.

Vortex rings, however, are very frequently produced in air by friction against solids, etc., and are seen issuing from the muzzles of discharged cannon, the smoke-pipes of locomotives, etc. Phosphoretted hydrogen, generated under water, usually leaves the surface of the liquid in vortex rings. Smokers produce them by arranging the lips in a circular form, as when we pronounce the letter O, and then gently expelling the smoke from their mouths.

The function of the smoke in these exhibitions is simply to render the vortex rings visible. They are just as readily produced in transparent air, as has been experimentally proved in various ways.

Prof. Tait, of the University of Glasgow, has recently performed with smoke rings some curious and highly interesting experiments, some of which I will now endeavor to reproduce upon a smaller scale.

I have here a large pasteboard millinery box, in the cover of which are two circular holes, about three inches in diameter, one at each end of the box. For smoke, I will mix the vapors of hydrochloric acid and ammonia. I first heat these two small saucers, and then pour into each a small quantity of the proper liquid. I next place the two saucers inside the box, and it becomes filled with a densely white vapor. Every time I expel a little of this vapor from one of the holes, by flapping a book on the palm of my hand against the other hole, you will observe that the smoke issues forth in the form of a cylindrical ring, moving in a line perpendicular to the plane of the ring, and revolving rapidly on its circular axis. The direction of this rotation corresponds on the inner side of the cylinder with that of the general motion of the ring, the outer side moving in the opposite direction.

Gaslight is by no means so favorable as daylight for the exhibition of these rings, which disappear or become very indistinct as they pass away from the immediate illumination of the gaslight to more distant parts of the room. You perceive, however, that they retain their peculiar form and whirling motion while they are visible. On impelling two of them against each other, they are not broken, but rebound from each other as though made of India rubber. This also accords with the mathematical results obtained by Helmholtz.

Sir William Thomson, the distinguished Professor of Natural Philosophy in the University of Edinburgh, at once seized upon these results as the basis of a new theory of the molecular constitution of matter. The construction of this theory has not yet been made public, I believe; but it is understood that its distinguished originator is still at work upon the mathematical investigations connected with it.

The fundamental idea of the hypothesis seems to be, that "a closed line of vortex core is literally indivisible by any action resulting from vortex motion. If, then, we suppose all bodies to be built up of vortex atoms, we give these atoms that infinitely perennial specific quality" which philosophers commonly attribute to atoms, by supposing them to be infinitely strong and infinitely rigid.

This latter "monstrous assumption," says Sir William, "has for its only pretext, that urged by Lucretius, and adopted by Newton, in which he has been followed by some of the most eminent modern chemists and physicists, namely: that it seems to account for the unalterable distinguishing qualities of different kinds of matter."

But Helmholtz has proved this quality to exist in a perfect fluid, when the motion, which he calls *wirbel-bewegung*, has been created. Actual experiment confirms this result—that is, when the smoke rings in air are so impelled as to come in collision, they cannot be made to penetrate each other's volume, but rebound with a certain resilience. Hence, Sir William concludes that they fully answer all the requirements of gaseous atoms, under the dynamical theory, and that, by packing them more closely, the properties of liquids and solids might be similarly accounted for, without supposing the atoms themselves to be liquid or solid.

Any diminution in the number of primary assumptions is obviously an important advantage gained for physical science; but I imagine that this investigation of the vortex rings will be more useful in elevating the ideas of philosophers out of the old grooves of thought, enabling them to range more freely in hitherto untraveled paths, than the final establishment of a theory based upon so complicated a fundamental idea.

Few philosophers have done more than Sir William Thomson, to advance the condition of modern physical science, and none are better aware than he, of the inconsistencies and absurdities of the old notions and hypotheses in relation to the molecular constitution of matter, which, however well they may have served to formulate laws governing phenomena known at the time of their inception, are entirely inadequate for that purpose in the existing state of physical science. A remark by himself, on the subject, will give a better idea of the anticipated value of this new hypothesis, than any criticism can do in its present stage. He says: "A magnificent display of smoke rings, which I recently had the pleasure of witnessing in Professor Tait's lecture room, *diminished by one* the number of assumptions required to explain the properties of matter, on the hypothesis that all bodies are composed of vortex atoms, in a perfect homogeneous fluid."

So far as the diminution of assumptions is concerned, I think I may claim a superiority for my hypothesis over all others, including that of the vortex rings; for not only is the number of primary assumptions diminished by it, but the properties of matter are actually reduced to the single one of *capacity for motion.*

The *Dynamo-Atomic Theory*, as mine may be called, if allowed to take rank as a theory, is fully adequate to account for all those phenomena upon whose occurrence is predicated the existence of such (so-called) primary properties of matter, as impenetrability, compressibility, elasticity, etc., admitting only the single assumption of the perfect mobility of matter. This theory includes, as a part of a more extensive generalization, the essential features of the "dynamic theory of gases," which is now fully received and advocated by such eminent European physicists as Clausius, Maxwell, Rankine, Thomson, Tait, Joule, Helmholtz, and others. Under the dynamo-atomic theory, we effectually dispose of the question as to the perfect hardness or the perfect elasticity of gaseous atoms. This question, involving the subject of the "clash of atoms," has a very important relation to the dynamic theory of gases, and perhaps constitutes its principal difficulty. We entirely remove this difficulty when we separate such properties from the atoms whose motions we attribute to associated forces.

I will close my remarks by calling your attention to the three radical and original propositions which I have heretofore announced, and which, from indications in foreign scientific journals, I expect to see generally accepted. These are:

1st. The independent existence of universal force, separate from, as well as associated with, matter; affording a simple and adequate explanation of gravitation.

2d. The definition of matter, as that which may be moved, strictly excluding from this definition the assumption of any other so-called properties of matter; and

3d. The explanation of all the apparent attractions and repulsions of matter, which, of course, includes an explanation of all physical phenomena, by the first two propositions, in simple and strict accordance with the mathematical laws of dynamics.

Adjourned.

## June 6, 1867.

Prof. S. D. **Tillman** in the chair; J. **Wyatt Reid**, Esq., Secretary

The Chairman presented the following notes on new discoveries and inventions:

### THE PROGRESS OF APPLIED SCIENCE.

Industrial exhibitions may be taken as the index of the extent of the practical application of scientific principles. The International Fair at the Crystal Palace, London, 1851, displayed the products of not quite 14,000 exhibitors. That at Paris in 1855, embraced 24,000 exhibitors. That at London in 1862, contained 29,000. At the present Exposition at Paris, there are no less than 45,000 exhibitors.

### INDIUM.

Richter of Friburg, exhibits in the Paris Exposition, two perfectly pure ingots of the newly extracted metal indium, weighing about five hundred grammes, and worth about 18,000 francs. Indium is said to resemble cadmium in its chemical qualities; the only marked difference is, that the oxide of indium (*indamat*) is insoluble in ammonia (*thilan*). Richter having no rival claimant—he and Dr. Reich being the discoverers of the metal—will receive a gold medal for the exhibition of a new metal.

### DECOMPOSITION BY GASEOUS CURRENTS.

M. Grennet, of France, has made the remarkable discovery that certain bodies are decomposed by the simple passage of a current of inert gas. For example, when a current of nitrogen, hydrogen, or common air is sent through a solution of the carbonate of lime, of baryta or of potash (*calcmarit, barmarit or kalemarit*), carbonic acid(*garet*) is set free, while lime, or baryta, or potash is precipitated. The gases will disengage sulphuretted hydrogen from the sulphidrates of the alkaline sulphides. In like manner, sulphurous acid gas may be disengaged from sulphide solutions, and acetic acid from acetates. Oxides of nitrogen are eliminated from nitrates at a temperature much lower than the temperature of decomposition. These salts emit acids very slowly in the same atmosphere, and a rapid current is supposed to simply increase this tendency to dissociation.

### PRODUCTION OF OXYGEN.

M. Mallet has discovered that proto-chloride of copper (*cupamad*), has the power of absorbing from the air an atom of oxygen, and thus becoming the oxy-chloride of copper (*cupamadat*), the latter heated to a temperature of 400° C, *i. e.* 752° F., parts with its oxygen, and returns to the state of proto-chloride, when it is again exposed to air, and becomes oxy-chloride. The advantage this process, for obtaining oxygen, has over Mothay's is, that it is not necessary to use steam. A kilogram of the oxy-chloride exposed to a current of hot air, will yield from twenty-eight to thirty litres of oxygen, while a kilogram of the manganate exposed to steam will yield about forty-six litres of gas. The oxy-chloride does not give out oxygen faster than it is obtained by decomposing chlorate of potash; the operation can therefore be carried on in glass vessels and on a small scale.

### STEEL WIRE.

The use of steel wire has been greatly extended since it became known that a wire could be produced which combined the advantages of lightness, with hardness and extreme tenacity. It is now employed not only in the manufacture of needles, fish-hooks, springs, music strings, small tools, umbrella frames, and crinolines, but also for ropes and cables. Steele wire rope is now used in many of the deep pits of the collieries of Great Brittan, where the light weight of the rope is of such importance both in respect to safety and economy; also on railway engines, and for drawing plows where stationary steam-power is used for preparing the soil. Large quantities have been required during the last five years for submarine telegraphic cables. For many years steel wire ropes have been used on the Morris canal, in New Jersey, for the purpose of drawing boats up its numerous incline planes. Some idea of the quantity of steel wire used, may be formed from the fact that one establishment in Great Britain has made, during the last year, more than 30,000 miles of one size, No. 13, equal in diameter to .095 of an inch.

### AEROSCOPE.

A very sensitive barometer, invented by Mr. A. H. Clum, of this country, was lately exhibited at a conversazione at the residence of Gen. Sabin, President of the Royal Society, London. It consists of a cistern containing seventy pounds of mercury, and a central column, two and a half inches in diameter, in which rests a float or buoy, supporting large cylinders or air chambers, made of German silver; these, owing to their large displacement of air, are so sensitive of atmospheric changes that exceedingly slight fluctuations in its pressure, such as would not be observed in the ordinary barometer, are indicated by means of a dial and moving hand, which may be read as easily as that of a common clock. The trouble of making a nice observation, by means of a Venier scale on the ordinary barometer, is thus obviated. The aeroscope, with its bright tubes and glass dome rising to the height of eight feet from the floor, is a handsome instrument; it however occupies more room than Hough's self-registering and printing barometer, which furnishes a record of the changes of atmospheric pressure at intervals of fifteen minutes through the whole twenty-four hours, and this without the aid of human eye or hand.

### ICEBERGS.

An unusually large number of icebergs have been lately seen in the North Atlantic. One vessel had to sail nearly two hundred miles in a southerly direction, along a perfect continent of ice, while others have met enormous icebergs much further south than they are commonly found at this season of the year.

### METEREOGRAPH.

Among the objects of great interest to scientists in the Paris Exposition, are the diagrams made by the admirable instrument for registering automatically the changes in the temperature, pressure, moisture and motion of the atmosphere, invented by Father Secchi of the College of Rome.

### BISMUTH.

A bismuth lode has lately been discovered in South Australia, which is said to be very rich, but being two hundred miles in the interior, some difficulty has been encountered in transporting it to the seaboard. There was also considerable delay in smelting the ore, but a quantity of ingots arrived in England lately, and it is expected that shipments of this rare and valuable metal will hereafter be regularly made.

### AMERICAN BREECH-LOADING RIFLES.

The following are the results of the trials of various breech-loading rifles of American invention, by a foreign military commission appointed to examine them. The Roberts breech-loader fired eighty-four balls in six minutes, an average of fourteen in one minute, each striking inside the target, and penetrating fifteen one-inch boards, laid side by side. The Sharpe rifle fired one hundred balls in less than seven minutes—more than fourteen per minute—and penetrated the thirteenth board. The Millbank rim-fire gun fired ninety-nine balls in six minutes and a half—over fifteen per minute—and penetrated the eleventh board. The Lamson gun fired twelve balls per minute. Ball's carbine threw seventy-five balls in nine minutes and a half. The Remington breech-loader fired one hundred balls in six minutes and fifty-three seconds, and penetrated the eleventh board. The Prussian needle-gun was tested in the same way as the others, and threw an average of six to seven balls a minute, penetrating the eleventh board. It will be noted that the action of the latter, which has acquired great notoriety since the late contest between Prussia and Austria, was inferior to most of the guns at this trial, and further, that a number of the best American breech-loaders were not included in that test.

Mr. S. H. Maynard remarked, in relation to this item, that advantage in a gun is not in the number of shots that can be fired in short time, but in the accuracy of the ball. He had fired his Prussian needle-gun twenty-one times in a minute, but this rate could not be kept up. He would prefer to have our soldiers armed with this gun.

### . FROZEN GLYCERINE.

At a late meeting of the London Chemical Society, Dr. W. S. Squire exhibited a fine specimen of frozen glycerine, and stated that it was a portion of five tons he had imported from Germany during the severe weather of the past winter. It was packed in eight-hundred weight casks, and the contents of all of them proved to be quite solid, and of a light brown color on their arrival in England. The sample exhibited was a portion which had not been liquified; its snow-like aspect was due to the removal of the coloring matter in the process of draining off the liquid portion. No sugar, or other known crystalizable substance, could be detected in the glycerine; the only impurity being about five per cent of water, and a trace of coloring matter. The solid was slightly heavier than the liquid portion, one being 1.268 and the other 1.26. Mr. Squire had been unable to procure again solid glycerine by exposing the liquid drainings to intense cold in the laboratory. Ice and salt, beside other freezing mixtures, had been tried, but with no other result than making it more viscid; and fragments of the solid dropped into the liquid did not lead to any result. Even a journey to Edinburgh and back, by railway, during the recent hard frost, failed to have any effect in determining its crystalization.

Dr. Vanderweyde suggested that the glucose, with which glycerine is sometimes adulterated, produced the result stated. Glycerine, pure, freezes at a very low temperature.

### LIGHT IN BASEMENTS AND NARROW STREETS.

Within the last three years, under many windows in basements as well as in narrow alleys in New York, where but little light has access, a metallic reflector has been set at an angle of forty-five degrees to the window, which has the effect of reflecting the light from above directly into the room. The same principle has been applied to gas lights, so that they can be placed above and entirely out of the way. In this way a flood of light is now thrown down in the ferry-houses, directly on the place where the floating-bridge and the ferry-boat meet. The *London Builder* says that windows opening into streets, which are generally very narrow in that city, give but little light in consequence of being set back several inches from the face of the building. It proposes to substitute a window placed flush with the front wall, in which all the panes are roughly ground on the outside; the light from the whole of the visible sky and from the remotest parts of the opposite wall will thus be introduced into the apartment reflected from the innumerable faces or facets, which the rough grinding of the glass has produced. The whole window will appear as if the sky were beyond it, and from every point of this surface light will radiate into all parts of the room.

### NUTRITION.

Dr. Rambosson has presented, at the French Academy of Sciences, a curious paper on the effects which different kinds of food produce on the nervous system. For many years past the writer had been making experiments upon himself by living entirely, for several days consecutively, upon the single element he wished to test, and even occasionally by remaining nearly forty hours without any food except a little gum. The conclusions he came, to from his experiments, were: 1. That certain articles of food exercise a special action on the motor, and others on the sensory system of nerves. 2. That the former particularly influence the intellect, and the latter the feelings, and that there are some substances that influence both systems, and, therefore, both the intellect and the feelings. Thus, having tried coffee after the training above described, he found that if he took a certain quantity of it very strong, a great change gradually came over him. His feelings were numbed. and his intellectual faculties became wonderfully active. He ceased to be communicative, was cold and peevish, and, in short, he acquired a disposition contrary to his natural one, his mind being constantly at work in spite of himself. When he remained long in this state, his intellect was unable to produce connected thought, but was still agitated; his sleep would be disturbed and his pulse would fall. By the use of a little food with good wine, tranquility was soon restored; and if he then read what he had written in a former state, he was quite astonished at the peculiarity of the ideas expressed, although they appeared perfeetly natural to him when they were first committed to paper. Wine, on the contrary, taken when the system was reduced by diet, and even in such small quantities as not to produce intoxication, rather obscured the intellectual faculties, and made him fell embarrassed about the slightest things, and fear lest he should offend. Yet it prompted him to freely utter any bad thoughts that entered his mind. These effects, described by one who had brought himself into an abnormal state, are certainly not such as follow the use of these beverages in connection with the regular allotment of food; but, they demonstrate that the too free use of any substance which acts only on a part of the system, may tend to derange the functions of a naturally well balanced organism.

After some discussion on the foregoing items, Dr. L. Bradley read the following paper:

## *ANTI-INCRUSTATION.*

It will be remembered that a few evenings since I exposed before the Society, Hays' method of preventing incrustation of steam boilers, which consists simply in making the boiler, with its contents, a part of the conducting circuit of a few cups of galvanic battery.

The possibility of any such effect, as claimed by the inventor, was broadly denied by Dr. Parmelee and Prof. Vanderweyde. They were not alone in such opinion, for I am told that Prof. Henry, of the Smithsonian Institute, denied the possibility of any such effect, declaring that he would not believe it if a score of men were to testify to it. At the Patent Office, too, I am informed that the claims were delayed at first, on the ground of non-utility, the examiner supposing that the effects claimed were impossible; and it was not until good affidavits were produced that the patent was granted. But the time has now come when doubting Thomases must succumb to the power of truth.

In addition to much positive testimony published in the West, where the method has been thoroughly tried, we now have living witnesses and standing monuments in this city, to whom any one, desirous of learning the truth, may refer. The effects of six cups of Daniels' battery (arranged for quantity), in breaking up and removing the incrustation from the boiler of the steamer Santee, running between this city and New London, Conn., also that at the Delamater Iron Works, at the foot of Thirteenth street, North river, has been what the agent, who put the appliance in operation, anticipated, and all that the owners could desire. It was only yesterday that Mr. Mulford, one of the proprietors of the above iron works, informed me that it had completely fulfilled their most anxious expectations; that at first the crust was from an eighth to three-sixteenths of an inch thick; and that it was soon observed, on blowing off, that the crust was breaking up and coming away; and that at the last opening the inner surface of the boiler was perfectly clean, and was as smooth and shining as though it had had a fine black polish. He further stated that now the facility in raising steam is much increased.

Here we have a new application of electricity to useful purposes, and the discovery of a fact hitherto unknown in physical forces.

Physics teach us facts and phenomena; natural philosophy teaches how to account for facts and phenomena. I am not aware that any philospher has yet satisfactorily accounted for the physical fact given above; but we are all at liberty to entertain our own hypotheses, and I will venture to suggest one:

It is well known that substances in opposite electrical states attract each other. Such state or condition is always present in all cases of aggregation, accretion or growth. The process of incrustation is due to some slight disturbance in the electric equilibrium between the shell of the boiler and the saline or earthy matters in the water. The shell being in connection with the earth, is always in a fixed electrical state; but evaporation in the boiler so changes the condition of the matters contained in the water as to admit of their attraction to and accretion upon the boiler.

In making the boiler a part of a galvanic circuit, the current pervades and passes through, not only the shell, but the water and all its contents, just in proportion to their conductivity, which is directly proportional to the area of the transverse section of the conductor, and to the specific conductivity of the material of which it is composed. Iron is specifically more conductive than water, but the area of the transverse section of the water is so very much greater than that of the shell, that we may assume their conducting power, in the whole, to approximate equality. The whole boiler and its contents, therefore, are continually pervaded by an equalizing force, sufficiently overwhelming to neutralize and quiet the slight disturbance caused by the evaporation, which had occasioned the accretion; consequently, there is no attraction between the boiler and the earthy matters, and no incrustation.

Whether there is anything in this hypothesis or not, no matter; the *fact* is established; and I apprehend that it is only the cropping out of a great principle, which will lead to the development of still more important results.

From the discussion which followed this paper, it was evident that further proof is required of the efficiency of this method of protecting steam boilers.

S. H. Maynard, Esq., exhibited specimens of wood pavement, and submitted the following paper, prepared by C. A. Williams, C. E.:

## *WOODEN PAVEMENTS.*

The subject of pavements possesses more than usual interest just at this time, from the fact that an effort is being made to introduce into this and other cities what is believed to be an improvement upon the old plans of stone pavements, viz: improved wooden pavement. And in order to a full understanding of the design of the plan now presented, a brief comparative review of the features of other plans, in connection with the requirements, is indispensable.

In considering the subjects of improvement, and especially those of an architectural or mechanical character, we must first ascertain the requirements, and then determine upon the best kind and most correct shape of the materials; and which questions can be determined by rules and data well known to experts and practical men, so that, although the ingenuity of the inventor may make many combinations in the shapes and positions of materials, it is generally not difficult to determine which is best adapted to the requirements to be kept in view. But it often happens that the hap-hazard inventor, or a random and uninformed delver in the field of invention and improvement, may originate a subject or method which is really an improvement on old methods, but in which it is mere chance, and rarely the case, if it is the *best* that can be done with the materials and for the requirements. Hence we see in pavements as in other things but partial improvements, leaving a wide margin for systematic invention. The requirements of a good pavement are a uniform and smooth surface; a foothold for animals; facility for removal for getting below it to the pipes, sewers, etc., and for repairs; and lastly, durability; which, however, should only be considered in connection with the question of economy and advantages possessed; for a cobble-stone pavement is among the most durable and cheap, while it is, at the same time, the most objectionable pavement which could well be laid in other respects. The incidental advantages of cleanliness, less wear and tear of vehicles and horses, and freedom from noise, may be added.

As to the question of any injurious effects of wooden pavements upon the health, that has been decided by the most scientific authority of the country, and also by long practical experience and observation, both in cities of this country and Europe; and in such constructions as require antiseptic compositions to be used as preservatives of the wood, or as cements, it has been fully proved that they have a contrary effect, by acting as disinfectants.

To secure these indispensable conditions of a good pavement for a large city, certain peculiarities of construction are necessary; and these conditions have been only partially met in the plans heretofore introduced. Any construction in which small blocks are used, necessitates the use of a continuous sub-sill or flooring, which makes the pavement difficult of removal in getting below it; and which construction, also, has the effect to displace or disturb portions of the pavement within short distances of a heavy load moving upon it, especially where there are small vacant spaces under it arising from unequal settlement, or from the filtration of water through or under it. This is evidenced in experimental constructions in this city, and elsewhere, in which a continuous sub-sill or flooring has been used. This construction, in which small blocks are used with so little bearing surface as to require a continuous flooring, is also not so substantial, for the reason that the stability of the different parts are dependent upon each other; for instance: if the bearing of the sub-sills is rendered unequal from any cause, the blocks are disturbed for some distance around. And again: the blocks being so small, with so little bearing surface to rest upon, they are, of course, more easily displaced by the action of vehicles, so as to open the joints to the filtration of water, either up or down through the pavement. Furthermore: the joints are very much increased in number and extent over what they would be with large blocks, making it much more difficult to render it impervious to water; which seems to be a necessary condition for a good wooden pavement. In the only construction of this kind, which has, so far, been adopted to any extent, the grooves for the horses' feet are only obtained in one direction, at right angles to the length of the street; whereas, if necessary at all, they are as necessary at the intersections of other streets as elsewhere, in proportion to the length occupied by those lateral streets. The plan of constructing and fastening together of the blocks in such plans, has also not been of so firm and substantial a character as it is capable of being made, especially with larger and heavier blocks; and it will not be disputed, that this construction is not the best to get the greatest durability of the materials. Yet, although this description of pavement has apparent defects, it has, in the opinion of many, based upon practical experience and tests, undoubted advantages over almost every description of stone pavement.

Such plans as require iron in their construction, either as a base, or by bolts to hold the blocks or sections in position, are liable to the objection of the rapid deterioration of the iron from the action of the water and earths upon it; the loosening of the bolts from contraction and expansion, and to other specific objections—in the different plans so far introduced—which need not be mentioned here.

Knowing, as we do, the requirements which are necessary, and that the defects of the constructions referred to, are so great as to be serious objections, the plan now submitted was designed to overcome those objections as far as practicable.

### NEW YORK WOODEN PAVEMENT—GENERAL DESCRIPTION.

It will be seen by the specifications, that this pavement consists of large and substantial blocks of wood, prepared against decay and fire, preferably of rectangular shape, and from six to nine inches in depth, varying according to the character of the travel of the street, and having a large area of bearing surface, generally not less than one square foot, superficial area, to rest upon. These blocks are grooved in their faces at intervals of about three and one-quarter inches, with deep transverse vertical grooves of about three-fourths of an inch in width, and from three to five inches in depth; which grooves are filled with cement while in a semi-fluid state, but which soon becomes hard and solid; thus rendering the block as solid as it was before grooving, while obtaining the advantages of a foothold for horses during the whole durability of the pavement—that is, the time taken to wear it down to the bottom of the grooves. Joint grooves are also formed where the blocks are in contact, by cutting rebates half the width of the grooves in the face on the sides of the blocks, so that when the blocks are laid in contact, the joint groove is the same width as those in the face; and by which construction, and by using good hard cement, the pavement is not only rendered solid and compact, but is practically impervious to water. The blocks being heavy when filled with cement—weighing over forty pounds each—and having a large bearing surface, and a large vertical contact fastened together by hard cement, they will not be easily displaced, even without the use of a sub-sill; but if a sub-sill is preferred, the large area of bearing surface of the blocks makes a "*sectional*" sub-sill admissible, which has all the advantages of a *continuous* sub-sill, without its disadvantages; the advantages being, ease of removal in getting below it, and making every part of the pavement so solid and substantial, as to be independent of the other portions, and not liable to the disturbance of springing, etc., above referred to. To give additional firmness where a sub-sill is not used, a dovetailed slot or groove is cut on the sides of the blocks, into which the cement runs from the joint grooves, and hardening, locks the blocks together, and tends to prevent their displacement either vertically or laterally. Or wooden keys may be inserted in the dovetailed grooves, thus securing the blocks or sections—in whichever way it may be laid—from any possibility of displacement.

If it is desired or considered preferable to have but one line of grooves, except at the intersections of the streets, the transverse grooving may be omitted, except at the lateral intersections. The grooves may also be made to break joints in one or both directions, either by varying the intervals between the grooves, or by the position of the blocks. And to obviate the wearing of the grooves into ruts, as has been the case in some of the plans described, at the intersections of lateral streets, the blocks should be laid at a small angle with the direction of the street, say from twenty degrees to twenty-five degrees.

The fact of the adoption of wooden pavement to a very large extent in other cities, and almost to the exclusion of all other kinds, and in localities where other materials could be obtained, would seem to be sufficient evidence that even constructions which are probably not the best, possess advantages over other kinds of pavement heretofore used; and the question of their practicability and advantages being therefore settled by the best evidence—that of actual test—the only question to be decided is the best shape to put the materials into, to meet the requirements heretofore alluded to, and which are well understood.

Since writing thus far, my attention has been called to the condition of one of the experimental pieces of wooden pavement laid in this city, upon one of the plans of construction then referred to—that of small blocks, with a continuous flooring—and I think it will be admitted that the references then made to the defects of that plan of construction will be fully borne out and substantiated by an examination of one, at least, of the experimental constructions of this kind, which has been laid but about eight months, and in which there are already a number of places—some half dozen—where the blocks are loosened from the bed and cement (coal tar and gravel), and settled to some extent, though not yet thrown out of place, and are affected in the manner before described, by heavy vehicles moving in the vicinity; and there is little doubt that they are loosened in precisely the manner stated. This specimen construction of this description of pavement also illustrates fully the difficulty, if not the impracticability, of obtaining a durable grooving *between* the blocks, by separating them with strips of board or otherwise; for a vacancy having been formed beneath the flooring, as before described, the continual working and springing of the flooring and blocks in many places has loosened the separating strip or picket from the blocks, and forced it up to the top of the blocks, carrying the coal tar and gravel, filling with it up to the surface of the pavement. It must, however, in fairness be admitted that the development of the defects referred to so soon—after so little use—may be owing to the work of laying being defective, from having been done by inexperts or other cause, as this plan of pavement has stood far severer tests for a much longer time. But it illustrates what has been many times before illustrated, that this description of pavement, constructed of small and light blocks, resting upon a continuous flooring, possesses the defects which have been pointed out.

## EXPERIMENT WITH LEAD PIPE.

Since the last meeting the following preparation for an experiment was made: Mr. John W. Chambers, librarian, was directed to go to one of the nearest plumbing establishments and purchase a coil of ordinary new lead pipe, such as is used by plumbers generally. He did so, in company with Mr. J. Wyatt Reid, and filled it with pure Croton water, taken from the same pipe which supplies the Institute, and, in the presence of several gentlemen, sealed up both ends of the pipe. This was done on Wednesday evening, just twenty-four hours previous to the meeting of the Polytechnic, June 6th. The coil thus sealed was carried into the meeting, and there unsealed.

Dr. D. D. Parmelee then poured a portion of the contents into a glass beaker, and passed through it sulphuretted hydrogen gas, when the dark color of the water revealed the presence of lead. Previous to this the Doctor had passed the current of sulphuretted hydrogen through pure distilled water, in the same beaker, and no discoloration took place.

Prof. Vanderweyde also examined the water from the pipe, and decided that it contained lead.

## FLEXIBLE GAS-TIGHT TUBING.

Dr. W. Rowell exhibited the improved tubing invented by W. B. S. Taylor. It is made of a double tube of India rubber, one within the other, and between the two is placed a preparation of glue, which makes the tube entirely impervious to gas.

Mr. Dudley Blanchard said he had noticed that the gas passing through the common India rubber tubing does not make as brilliant a light as that carried through iron pipes.

Prof. P. H. Vanderweyde said he had made bladders of glycerine, and filled them with gas which kept for three months, and, on opening them, found the gas to be pure as when first put up.

## NEW PROCESS FOR MAKING ICE.

Prof. Vanderweyde made some experiments with the light products of petroleum, first called by him chimogene. He showed how chimogene, a new liquid formed by condensing the gas escaping from petroleum distillations, might be used for producing ice. Placing some test tubes containing water in a glass containing a little chimogene, he caused the latter to evaporate by exhausting the air, and the water was immediately changed into ice. He has patented the process, and constructed a machine for making ice on a large scale. It is like a tubular boiler containing the chimogene, the water being frozen in the pipes, which are so constructed that the ice may be readily removed. It was stated that ice may be thus made at a cheaper rate than by the ammonia process.

## *CLOSE OF THE SESSION.*

At the conclusion of the discussion on the formation of ice, Prof. Tillman retired, and, on motion, Dr. Warren Rowell took the chair.

S. H. Maynard, Esq., in a few appropriate sentences, complimented the permanent Chairman for his exertions to further the interests of the Polytechnic, and concluded by moving that the thanks of the Association be tendered to Prof. S. D. Tillman, for the able and dignified manner in which he had presided at their discussions.

Dr. John B. Rich seconded the motion, and spoke of the large amount of interesting matter which had been gathered by the Chairman, chiefly from foreign journals.

Dr. D. D. Parmelee followed, approbating the zeal and ability evinced by the Chair.

The resolution was adopted with applause; after which, the Association adjourned to September.

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## September 19, 1867.

Prof. S. D. Tillman in the chair; J. Wyatt Reid, Esq., Secretary.

The first autumnal meeting was called to order by the Chairman, who, after a few congratulatory remarks on the presence of so many of the regular attendants of the Polytechnic, offered the following summary of scientific news, which had been made up by him weekly during the vacation commencing on the second Thursday in June.

### PURE ACETIC ACID.

Ficter, of Berlin, uses baryta (*baramat*) in preference to soda (*sodemat*) or lime (*calcamat*) in the manufacture of pure acetic acid from crude wood vinegar. The acetate of baryta withstands the roasting necessary to get rid of the empyreumatic matters better than the acetates of lime or soda, in consequence of which there is less loss of acetic acid.

### TIN FOIL.

Nearly all tin foil now used is adulterated by lead. Dr. J. H. Baldock found, by chemical analysis, that common tin foil contained 86.96 per cent of lead; embossed foil, 76.57 per cent; tea foil, 88.66 per cent, and the so-called pure tin foil, 32.62 per cent of lead. The adulterated article is made by placing an ingot of lead between two ingots of tin, and rolling them into sheets which have a coating of tin on both sides.

### COLD AFFECTING THE REGULAR GROWTH OF TREES.

At the late Botanical Congress, Prof. Caspary, of Königsberg, gave the results of some elaborate observations on the effect of low temperatures in altering the direction of the branches of trees. He stated that different species were acted on in diverse ways; some species move, during a frost, directly upward, while others move downward; but in nearly all there was a lateral movement toward the left.

### VITALITY OF SEEDS.

M. Pouchet, of Rouen, had found that a small proportion of the seeds of *Medicago Americana*, a leguminous plant, can withstand a continuous boiling four hours, without losing their vitality. Many seeds thus treated were broken open, their outer integument not being able to resist the swelling of the contents; but those seeds which resisted the high temperature, retained their power of germination, and sprang up in the course of ten or twelve days after they were sown.

### GILDING BY AMALGAMATION.

M. Dufresne, of Paris, has introduced a new process for gilding. He first covers the article to be gilded, by decomposing a basic salt of mercury, by means of a galvanic battery, then precipitates gold by the same means upon it; and lastly, covers the article with another deposit of mercury. The article is then heated in a furnace until the mercury passes off as a vapor, when the coating of gold is found adhering to every part of the surface. If the volitilization of the mercury is carried on in a close furnace, there will be no danger to the workmen.

### NEW USES OF MICA.

Mica, coated with a silver film, is now used in this country for large reflectors. Puscher, of Nuremberg, has suggested the employment of silvered mica for covering curved surfaces, the flexibility of mica giving it great advantages over glass. After being heated, mica loses most of its flexibility, but it then makes a beautful material for inlaying work. A pretty effect is obtained by scattering small fragments of mica on freshly poured sheets of gelatine, and varnishing it with a dark solution of gelatine. Finely ground mica, mixed with a solution of gum arabic, may be used for a silver ink.

### SPECIFIC HEAT OF SOILS.

Pfraunder, in his investigations concerning the specific heat of soils, during which he determined that of seventeen different soils, has noticed that soils free from humus have the lowest specific heat, whether they consist of lime or sand. The richer a soil in humus, the higher is the specific heat. Thus peat was found to have 0.507, and a soil very rich in hnmus gave 0.4142, while that of calcite and quartz is only twenty and nineteen. Loamy soils must have a high specific heat, owing to the presence of water. These facts are important to the agriculturist, since a plant sensitive to the changes of temperature would not grow well on soils of low specific heat.

### CANDLEING EGGS.

This operation of looking through an egg, by means of a candle placed behind it, is called candleing an egg, by poulterers, who have taken advantage of its transparency in order to ascertain its soundness. From a mere trade practice, it has risen to the dignity of a scientific manipulation, and more perfect apparatus has been made for detecting the changes going on within the egg at different periods of incubation; also for assisting in researches on the formation of monstrosities, by coating portions of the shell. Carbonnier's apparatus consisted of a hollow cylinder, in the center of which was a powerful light. The *Bulletin de la Societé d'Acclimatation* has lately published the description of another plan, which consists in a screen, sliding in a groove cut in a block, used as a pedestal. This screen, which is of wood, has a longitudinal slit in a vertical direction, behind which is a lamp, the light of which is imprisoned, so as only to fall on the egg placed in front of the slit. In large egg-hatching establishments eggs are generally candled on the tenth day of incubation.

### A TREMBLING PLANT.

Besides the class of sensitive plants which display a kind of irritability at the approach of some extraneous body, there is another class having spontaneous motions without any apparent cause. Until lately, only one plant was known to be thus affected—the *Hedysarum gyrans*. Mr. H. Lecoq reports to the French Academy of Sciences a similar action in the *Colocasia esculenta*. On visiting his hot-house in January last, he perceived a motion in one of the leaves of this plant. At first he attributed it to a draft, but on examination, remarked the same motion in four other leaves only. This rythmical tremor was strong enough to affect leaves of other plants in the immediate neighborhood Daily observations convinced him that the motions of the Colocasia were not regularly periodical. Sometimes they would last all day and through the night; but generally they commenced at nine in the morning, and continued until noon. Not unfrequently the plant would remain in a state of perfect rest for days, and even whole weeks. This induced Mr. Lecoq to attach a few light bells to the plant, in order to be warned of the approach of the paroxysm. On one occasion it began two hours after midnight, and continued nearly the whole morning. The bells tinkled, and the leaves were found to make between one hundred and one hundred and twenty pulsations per minute. The fits were exceedingly violent on several other occasions. On the second of March last, although the temperature of the hot-house had fallen to seven degrees C, *i. e.*, 44.6 degrees F., the plant seemed to be laboring under a fit of ague, and the pot containing the plant, and weighing about ten kilogrammes, shook so that the hand of a man could hardly steady it. The rythmical tremor was likewise communicated to the fine leaves and clusters of flowers of several plants in close proximity. Mr. Lecoq cannot explain the cause of this tremor, but he thinks himself warranted in not attributing it to the temperature. He suggests the possibility of its being the result of a stoppage in the regular perspiration of the plant.

### ACTINESCENCE.

M. Carey Lea, of Philadelphia, has published in the June number of *The Philadelphia Photographer*, a new and plausible theory to explain the nature of the latent image produced by the action of light. It is well known that certain bodies exposed to a bright light, and afterward removed to the dark, have power to emit a distinct light. The action, lasting in some cases only a few hours, and in others several days, is called phosphorescence. Another class of compounds have the power of changing the refrangibility of light in such a manner that the most refrangible rays, which, when first emitted are invisible, may be made to display a beautiful blue color. The phenomenon of phosphorescence is explained by supposing that light gives to the molecules of a sensitive body a vibratory motion, which continues for some time after the exciting cause has been removed. Mr. Lea asserts that there is not the slightest reason to doubt that bodies may be endowed with the power of being impressed by the actinic rays, and of retaining them, precisely as bodies may the illuminating rays. Herein lies the explanation of the physical or latent image. It is simply a phosphorescence of actinic rays.

Pure iodide of silver (*argamav*) undergoes no decomposition by light when thoroughly isolated from all substances, organic and inorganic, which are capable of aiding in affecting reduction. But if exposed to light, it continues for a certain time thereafter to retain the vibrations it received; and, just for so long as these vibrations continue, will it be instantly decomposed if brought into contact with any substance which would have caused its decomposition had the two been subjected to the light together. For example, iodide of silver is exposed to light in the presence of pyrogallic acid, and nitrate of silver is reduced. If the iodide be exposed separately, it is thrown into a state precisely similar to that of a phosphorescent body, except that it sometimes continues to vibrate in unison with the actinic instead of the illuminating rays; and, so long as this condition remains, if it be brought in contact with the above-mentioned substances, the effect is the same as if they had been exposed together to ordinary light.

For this property of light Mr. Lea proposes the name of *Actinescence*, which has the merit of indicating the parallelism of the phenomenon to that of phosphorescence. The faculty of receiving a latent developable image depends, therefore, on two properties. The first is that of being decomposed when brought in contact with certain agents in the presence of light, that is, of being *sensitive to light.* The second is that of being able to retain the influence of the chemical or actinic rays, so that after the removal of light, decomposition may be effected when in contact with those certain agents alluded to, that is, the property of actinescense. Mr. Lea's experiments and deductions are of great interest to those who are studying photo-chemistry.

### SHOOTING STARS.

The November meteors have been the subject of several papers by European astronomers. Among the most important, are five letters from Schiaparelli, of the Brera Observatory, at Milan, to Father Secchi, which have been published in the *Meteorological Bulletin* of Rome. He believes matter is disseminated in celestial spaces in all possible grades of division, from the larger stars to the cosmical clouds formed in space by the local concentration of celestial matter, in a manner analagous to the crystallization of substances chemically dissolved in liquids. A cosmical cloud cannot really penetrate the interior of the solar system, unless in the form of a parabolic current, which may be myriads of years in passing its perihelion, like a long river having comparatively small transverse dimensions. That part of such a current, encountered by the earth in its orbital motion, appears to us in the form of showers of meteors diverging at a certain radiant. A great number of these meteoric currents are probably moving at various distances, and in various directions within the solar system, sometimes passing through each other without disturbance, and in other cases, by interruption, forming multiple currents, and under some circumstances forming closed elliptical rings. The November meteroroids appear to be portions of such a ring now in the process of formation.

Shooting stars cannot be accounted for by supposing the existence of cosmical clouds having short periods of revolution, for such clouds cannot, in obedience to the known laws of universal gravitation, have a permanent existence.

The state of dispersion of matter forming parabolic currents is increased after passing the perihelion. When the current meets a planet, in particular cases great perturbations may ensue, resulting in a separation of some of the meteoric stars into special orbits, which may then be distinguished as sporades. Thus, meteoric stars which were regarded by many as atmospheric phenomena, by Olbers and Laplace as matter from the moon, and by more recent investigators, as members of the planetary system, truly belong to the category of the fixed stars; they have the same relation to comets that the asteroids do to the larger planets, their great number compensating for the smallness of the mass. A falling star, bolis, and ærolite differ only in their magnitude. They are fragments of the matter of which the stellar universe is formed; they contain no chemical element not found on the earth; and as the revelations of the spectroscope render it probable that there is a similarity of composition of all visible bodies of the universe, they add a new argument in favor of this view of the origin of shooting stars.

### IMPROVEMENT OF STARCH.

A small quantity of epsom salts (sulphate of magnesia or *magmasot*), added to starch increases considerably its stiffening powers, and renders the articles on which it is used, to a certain degree, fire-proof.

### THE MUSKETO.

Each female lays annually about 300,000 ova. Being deposited on the surface of water they are devoured, by fish and other aquatic animals, in such quantities, as to greatly lessen the evils which follow their propagation.

### STEELE COOKING UTENSILS.

It has been proposed to use Bessemer steel for cooking in place of copper, which is easily acted upon by acids. Steel vessels can be made very thin to rapidly conduct heat, and may be brought into any form without the use of rivets.

### NEW SILICUM COMPOUND.

Friedel and Ladenburgh, have prepared a body containing one atom of hydrogen, one of silicon and three atoms of chlorine. It boils between 34° and 37° 5 C, the vapor of which mixed with air, explodes on contact with an ignited body. The gas is not spontaneously inflammable at ordinary temperatures.

### STEEL RAILS.

On the London and Northwestern Railway, at Chalk Farm station, is a rail, made of Bessemer steel, which has outlasted twenty-five iron rails successively placed next to it on the same line. The economy of the steel rails is so apparent, that several prominent roads in this country have commenced substituting them instead of the ordinary iron rail.

### JUPITER MOONLESS.

On the 21st of August next, an event will occur which has been only twice recorded in the history of celestial phenomena; Jupiter will appear without satellites. Three of them will then be passing across the planet's disc and the other will be immersed in its shadow. The apparent absence of moons will not last more than two hours.

### TO CEMENT BRASS ON GLASS.

Puscher uses a cement, particularly adapted for fastening brass on glass lamps, which consists in a rosin soap, made by boiling three parts of rosin with one part of caustic soda and five parts of water, which is mixed with one half its weight of plaster of paris. This cement has great adhesive power, and is not permeable by petroleum; it sets firmly in less than an hour, and is a very slow conductor of heat. Zinc white, white lead, or precipitated chalk may be substituted for plaster of paris, but the material will be longer in hardening.

### GEOLOGY OF CHINA AND JAPAN.

Mr. Raphael Pumpelly furnishes in paper 202, of the Smithsonian Contributions to Knowledge, the results of his explorations in China and Japan He states that the Sinian elevation is the extensive N. E. and S. W. system of upheaval, which is traceable through nearly all Eastern Asia, and to which this portion of the continent owes its most salient features. There is a striking analogy between the Sinian and our Appalachian range as regards structure, strike and dip, and what is more remarkable, the elevation of each has determined the eastern boundary of a vast continent.

### SPONTANEOUS CHANGE IN GLASS.

About a year ago Mr. Newell, of Philadelphia, constructed a photographic wagon, like those seen in many small villages which cannot furnish business for a permanent establishment. To light a part of it he used orange-colored glass, on account of its being impermeable to the violet or actinic rays. After some time he found himself troubled with what are technically called "foggy plates;" on substituting orange-muslin for orange-glass, the fog vanished from the plates, and on examining the glass it was found to have materially changed in color. Similar changes in glass have noticed by others.

### TAR LIQUOR.

M. E. Guyot exhibits specimens of this popular pharmaceutical preparation at the Paris Exposition. It is made by heating in distilling apparatus, in a sand bath, eleven kilogrammes of tar from Norway, one of carbonate of soda, and twenty litres of water. He then adds to the liquor, which has not passed over the still, sufficient water to produce forty litres of liquid. After being allowed to settle, the clear part is poured into a barrel, and the volatile portions obtained are then added. The whole is well stirred for some minutes, and after standing for several days it is filtered. The result is a dark brown liquor, of strong aromatic taste, which is mixed with water to form tar water. One ounce contains one grain of resinous matter.

### PHOSPHORESCENT ANIMALCULES.

The beautiful luminosity seen on a summer's night in the ocean, illuminating the track of a vessel, proceeds chiefly from invertebrate animals. Prominent among these is the *noctiluca miliaris.* It has a gelatinous transparent body, nearly in the form of a peach, but only about one-sixtieth of an inch in diameter. From the bottom of an oval cavity in it is often protruded a delicate filament, having an undulatory motion, which Khron supposes is for the purpose of sweeping in nutritive matter. The illuminating power of *noctiluca* does not serve the same purpose in each species. The fire-fly (*lampyris noctiluca*) uses it to attract the opposite sex, and can extinguish or renew it at pleasure; but in the *miliaris* it probably serves to attract more minute animal forms which are its prey.

### COLORS FROM PROTEIN COMPOUNDS.

Erdmann observed that some roast veal was superficially red; he transferred a portion of the red matter to other substances, and found that with moisture and a proper temperature, the coloring matter increased. It is probably produced by infusoria, in the same sense as alcohol is made by yeast. Researches on blue milk, made by several German chemists, show results closely analagous to those made by Erdmann.

### THE COAST OF SWEDEN.

Thirty-two years ago, Sir Charles Lyell examined ancient sea-marks in Sweden, and concluded the coast was gradually rising. The Earl of Selkirk has recently examined the same sea-marks, and arrived at an opposite conclusion. He believes the apparent change is due to fluctuations in the level of the water, and not to an upward movement of the land. This subject will doubtless be investigated by other geologists.

### LOCAL ANÆSTHESIA.

*The London Lancet* alludes to a case which has important reference to the question of local against general anæsthesia. An abscess was removed from a young woman in the Middlesex hospital, after congelation of the part had been rapidly produced by the application of paraffine ether. The result has been, that a portion of the skin, nearly an inch square, has sloughed, and its healing will necessarily be attended by an unseemly scar.

### OZONE GENERATOR.

A new generator of ozone, exhibited at a conversazione given by the President of the Royal Society in London, consists of a number of flat plates of glass, covered with tin foil, and piled one upon another, leaving a small space to effectually separate them. Each plate represents a Leyden jar, and, when the whole pile is electrified, a stream of air, forced through from one end of it to the other, becomes so strongly ozonized that breathing is painful and dangerous. The stream of ozonized air can be used for bleaching and other purposes. It has been employed on a large scale in refineries for decolorizing sugar.

### SILK PLANT.

In Peru, a plant is found growing to the height of three or four feet, which bears a great number of pods, inclosing a silk-like fiber, which is declared to be superior in fineness and quality to the production of the silkworm. It is a wild perennial; the seed is small, and easily separated from the fiber. The stems of the plant also contain a fiber superior in strength and beauty to the finest linen thread. Small quantities of it have been woven in a rude manner by the Indians; the texture of the cloth is said to be of unsurpassed brilliancy. Preparations are now being made to cultivate the plant on an extensive scale.

### ADULTERATION OF SOFT SOAP.

A fraud is extensively practiced in France, and perhaps other countries, in the manufacturing of soap. M. Rouissin, of Paris, reports, in the *Journal de Pharmacie,* that of sixteen samples purchased indiscriminately, not one was free from adulteration; they contained from ten to twenty-five per cent of starch, which improves the appearance of the soap. The microscope reveals the presence of granules of starch, which are swollen, perhaps by contact with an alkali. The adulterated article can be detected by dissolving a small quantity with alcohol; the starch is rapidly deposited as an insoluble precipitate.

### LYCOPERDON.

Ernest Baudimont, of France, has made some interesting calculations regarding the growth of the *lycoperdon giganteum,* a genus of fungi. Fourteen days elapsed from the time of the first appearance of the plant above the ground until it arrived at full maturity. It measured about forty-one inches on its greatest circumference, and weighed 7.7 pounds. It was very nearly of a regular spheroidal form, with a very short peduncle of a very beautiful white color and slightly rosy; the skin was distended and elastic under the finger. After speaking of the chemical analysis of the plant, M. Baudimont estimates the number of cellules in the ball at more than fourteen and a half billions; and since it was fourteen days in maturing, over a million of cellules were formed every four hours, or twelve thousand per second! The spores are a hundred times more numerous than the cellules. Think of 1,200,000 spores being formed between two strokes of a pendulum, without any disturbance of the mysterious equilibrium which reigns within! How prodigious the energy which consummates this growth!

### THE HOOSIC TUNNEL.

While European engineers are engaged in piercing Mount Cenis, to make a railway connection between France and Italy, American engineers are steadily, but rather slowly, penetrating a spur of the Green mountains at Hoosic, in order to complete a railway communication between the valleys of the Hudson and Connecticut, and making a more direct route from Troy to Boston. The work is progressing more rapidly on the eastern end, where, by means of a water-power on the Deerfield river, air is compressed and forced through iron pipes more than four thousand feet, to a point where it keeps in constant motion a number of drills, and, when it has spent its power on the pistons, furnishes the workmen with fresh air. The advance through the solid rock on the eastern face is at the rate of ninety feet per week. It is estimated that the tunnel will be completed within five years. Nearly $2,000,000 have been spent on the work. The central ventilating shaft has been sunk to the depth of four hundred and fifty feet. When it has reached one thousand one hundred and thirty feet, work will be commenced at that point, in both directions on the main tunnel.

### ENGRAVING BY ELECTRICITY.

Gaiffe's electrical engraving machine, lately much improved, is in the Paris Exposition. Any number of plates may be engraved at once; the tool cuts them as in the ordinary lathe, and the rest is operated by means of a platinum point, which passes over the design made with a varnish. The point, in passing the varnish, breaks the connection of the electric current, and thus demagnetizes an electro-magnet behind each graver, and allows a spring to press the graver against the plate on each machine. When the point touches the unvarnished part of metallic plate, containing the shades of the design, the electrical current is again established, and the electro-magnet draws back, by its attraction, the graver thus overcoming the force of the spring. It is easy to see how comparatively plain work, like maps, could be executed with this machine; but it is difficult to imagine how the depth of line in a delicate copper plate is to be graduated by a graver governed by one pair of electro-magnets. The multiplication of copies in this plan is not as feasible as to duplicate the original plate by means of the try-telescope process.

### SENSITIVE FLAMES.

We have previously noticed the experiments by Prof. Tyndall, of London, showing the manner in which gas flames are affected by sound. Mr. W. T. Barrett, lecturer on physical science at the International College, who early made extended observations in this direction, thus accounts for the phenomena. A sensitive flame is one in which, on the slightest mechanical increase in the pressure, or, what here comes to the same thing, in the velocity of the gas as it issues from the burner, will change its shape and take very much the appearance it has when influenced by sound. Now the sonorous pulses excited by sound throw, among other things, the pipe which conveys the gas to the burner into vibration; the flow of gas is thereby driven from the sides and urged more toward the center of the tube; and the current thus confined, within narrower limits, must issue from the burner with increased velocity so long as the sound continues. It is the greater rapidity thus induced in the issuing stream of gas which causes the flame to shorten and diverge; lowering of the flame being an analogous effect to that noticed and explained by Dr. Thomas Young, in his well known experiments on streams of smoke ascending into the air at different velocities. Several cases illustrating this action, and confirming his opinion, are described by Mr. Barrett, in the April number of *The Philosophical Magazine.*

### MOUNT HOOD, OREGON.

The Rev. H. K. Hines has given to the Royal Geographical Society, of London, an account of his ascent, in company with three residents of Vancouver, to the summit of Mount Hood. They found that at forty feet below the summit water boiled with the thermometer at one hundred and eighty degrees. He estimates the height of Mount Hood at 17,640 feet, which is higher than any summit in North America or Europe. The view from the top of

Mount Hood was magnificent. The whole line of the cascade range, extending from south to north not less than four hundred miles, is at once under the eye. In this distance could be seen seven snowy peaks. Eastward the Blue Mountains were in view, and lying between are the broad plains watered by the Deschutes, John Day's and Umatilla rivers. On the west, the piney crests of the coast range, cut clear against the sky, with the Willamette valley sleeping in quiet beauty at their feet. The broad silver belt of the Columbia winds through the evergreen valley toward the ocean. Within these limits is every variety of mountain and valley, lake and prairie, bold beetling precipices, and graceful rounded summits, blending and melting away into each other. Mr. Hines confirms the account given some time since in our columns of the vast precipice on one side of Mount Hood. He found the very top of the mountain was so sharp that it was impossible to stand erect upon it. Its northern face is an escarpment, several thousand feet high. He could only lie down on its southern slope, and, holding firmly to the rocks, look down the awful depth.

## SUGAR MADE BY OSMOSE.

The tendency to diffusibility in liquids separated by a porous septa, has been successfully used in applying this osmose principle to the manufacture of beet-root sugar in France. The apparatus invented by Dubrunfant, in 1863, called the osmogene, is on exhibition, in its most improved form, at the Paris Exposition. It occupies a space of a little more than four feet square, and is of the height required for distributing vessels for water and molasses. It contains fifty or sixty frames, forming partitions about four-tenths of an inch thick, and containing bars and cords to support the sheets of parchment paper which are used as septa. The water-frames, alternate with those containing molasses or sirups. Each frame has two apertures, one giving passage to hot water and the other to sirup, so that from two contiguous partitions water and sirup are obtained. The two liquids start from the height of about forty inches, arrive at the base of the apparatus, and ascend in order to leave the higher orifice at a temperature of seventy to eighty degrees, Cent. Circulation is also given in a contrary direction. The machinery which is used in supplying liquids is stopped every second day for washing the interior of the apparatus, first with hydrochloric acid, and afterward with a jet of steam, which requires about four or five hours, and on which the success of the whole operation depends. One man and a boy can attend to a group of osmogenes, as all they have to do is to regulate the flow of the liquids. The in-flowing sirup is heated to the boiling point of water. The expenditure for labor, coal, parchment and animal black, is about one franc and forty centimes per one hundred kilogrammes, which give about twenty-five kilogrammes of sugar.

## FEEDING SERPENTS.

Replying to letters which have appeared in some of the London papers, condemning the practice of feeding serpents in the Zoölogical Gardens with living animals, Mr. W. Matchwick says, that for nearly thirty years he has been in the habit of frequently visiting the gardens in the Regent's Park, and has on various occasions witnessed the rare, highly interesting and instructive spectacle of a boa taking his food. Much misconception exists on this subject. All constricting serpents feed on living animals of some kind. You might as well offer a python or a plum-cake as a dead kid; they feed also at long and irregular intervals. The stories about the special fascination of snakes, the trembling agony of their living victims, and all that sort of thing, are very questionable indeed. He had repeatedly seen boas and other large constricting snakes take rabbits, pigeons, &c., and never once observed the slightest symptoms of fear in the living food, On the contrary, the rabbits frisked about, often getting on the snake itself, and showing no other feeling but that of curiosity in being shifted from some other place. So, also, with venomous snakes. There is no specimen more repulsive to look at than the puff adder (*clotho arietans*). Bloated and swelling, its fixed, gem-like eyes, malignant and threatening, ever watchful and ready to strike, the puff adder is the very type of its kind; and yet he had frequently seen the small birds, given it to eat, flit and flutter all round on and about him, totally regardless and unaffected. And then as to the manner of death of the living animals thus given: in the case of the boa it is just as quick and merciful as any one could desire. Struck (for holding) like lightning, and at once enfolded, the rabbit dies instantly. With the *clotho*, or the rattlesnake, it is nearly as quick and quite as merciful. Struck with the poison fang of the snake, the bird, or other animal, is instantly seized with a mysterious paralysis, and soon completely dies. There is nothing cruel in all this; there is much to instruct and to wonder at.

## THE ATLANTIC CABLE.

An article in *The North British Review* on submarine telegraph, contains some interesting statements regarding the action of electricity, and the mode of using it in the Atlantic cable. Electricity seems to have no proper speed, in the usual sense of the word. The speed depends in each case on the condition of the conductor, and may, on certain conceivable conditions, be regarded as infinite, though we have no proof that the laws now known hold good up to, or nearly up to, this limit. When the Valentia end of the Atlantic cable is joined to the signaling battery, a current rushes into the cable without any perceptible loss of time, but no effect whatever can be perceived in America for at least one-tenth of a second; after, say fifteen hundredths of a second, the received current begins rapidly to increase, according to a definite law, and if the battery contact at Valentia is continued, the current entering the cable there, and flowing out of the cable at Valentia, will be sensibly equal, after say two and a quarter seconds. After this the currents would remain equal so long as the battery continued in action. When the battery contact is broken at Valentia, and the cable put to earth, the current flows on at Newfoundland for say one-tenth of a second, as if nothing had happened; it then begins rapidly to decrease, and it sensibly ends say two and a quarter seconds after the contact was broken. Thus the current arrives in gradually increasing waves, and dies out in a precisely similar manner.

In order to produce a succession of distinct and legible signals, it is not necessary that the wave should reach its maximum and fall to its minimum at each signal. If the sending battery contacts are changed or reversed before the full height of the wave is reached, the wave is not obliterated, it is simply diminished; if battery contacts, alternately with one and the other pole of the battery, succeed one another with considerable rapidity, say three reversals every second, or ninety dot signals per minute, the waves will be reduced to say ten per cent of their maximum; but if we can render these little waves visible, they may be interpreted as legible signals. The old Morse system, which simply indicated a blunt yes or no, could not show these little waves, or follow them in any way. Sir William Thompson's reflecting galvanometer does render these little waves legible, even when they are no larger than one per cent of the maximum current. The received current deflects a tiny magnet to and fro. A little mirror, swinging with the magnet, reflects a spot of light on a distant scale, where by its oscillations the spot of light indicates movements of the magnet too small to be seen. The little swinging magnet follows every change in the received current, and every wave, great or small, produces a corresponding oscillation on the spot on the scale. These oscillations, produced in due order, are easily read by a practiced clerk—no one knew how easily. The sending arrangements were designed to produce perfect regularity in these little waves, making them as sharply defined as possible; but just as by a practiced eye handwriting can be read in which there is no single clearly-formed letter, so it has been found a clever clerk will instinctively, as it were, disentangle the most irregular oscillations of the little spot of light into letters and words they should represent; and from this cause the greater part of the sending gear has been found unnecessary, and yet the bold estimate of eight words per minute has been exceeded. The addition of a single simple little instrument allows four times the number of words to be sent through the Atlantic that could be sent through the Malta-Alexandria cable, of little more than two-thirds the length. Here, then, is at least as great an advance as in other branches of submarine telegraphy. In future long cables the speed may be calculated on this new basis, which has long been advocated by a few, but which had not received practical confirmation till now. The speed at which messages can be sent through a given length of cable is simply proportional to the quantity of copper and gutta-percha used, provided the relative proportions of these materials remain unchanged, as is now practically true in most cases.

The signaling arrangements connected with the Atlantic cable present this peculiarity, that there is no voltaic circuit. The current is received at Valentia in a Leyden jar or condenser, which acts as a sort of elastic reservoir. When receiving, it is alternately charged by the cable and discharged back into the cable; while the galvanometer, placed between the condenser and the cable, indicates the alternate forward and backward tide in the current. Similarly when Valentia wishes to send signals, it charges the condenser positively or negatively, by the induction from the battery, and thus causes corresponding movements in the charge of the cable. This arrangement is due, we believe, to Mr. Varley, and prevents, to a great extent, the action of earth currents, which would otherwise be found troublesome with so sensitive an instrument as the mirror galvanometer.

### COAL IN POLAND.

Borings along the line of railway in Poland have led to the discovery of five seams of coal. The last was found at Dombroff.

### NEW DYES.

Messrs. Girard and De Laire have obtained a patent in France for extracting three new dyes from the black residuum formerly thrown away in the manufacture of rosanaline.

### TO DETECT FREE ALKALI IN SOAP.

If the soap contains rosin, Puscher recommends adding neutral sub-nitrate of mercury to a solution of the soap. To a solution of the soap containing no rosin, calomel or corrosive sublimate may be added, which results in the formation of the black sub-oxide of mercury.

### TO CLEAN STEEL PENS.

When a pen has been used until it appears to be spoiled, place it over a flame (a gaslight, for instance,) for say a quarter of a minute, then dip it into water, and it will be again fit for use. A new pen, which is found too hard to write with, will become softer by being thus heated.

### TANNING.

The report of the commissioners having charge of this department of the Paris Exposition, have arrived at a conclusion which will meet the approval of practical chemists regarding the various processes for rapid tanning, namely: That no definite advantage has yet been found in these processes, and the period required remains about the same as before.

### SUGAR IN MUSCLE.

Dr. Rankee, of Munich, has, by recent experiments, confirmed the discovery made by Meissner, that a true, fermentable sugar exists in the muscle, which is increased by muscular action (tetanisation caused by strychnine or electricity); and further, that the liver has no effect in causing this increase; for the sugar is proved to arise in the muscle itself, and not from muscular substance.

### NICOTINE.

Mr. Melseus, a Belgian chemist, finds the proportion of nicotine in tobacco varies greatly in different specimens. That grown in France contains nearly eight per cent, while in that from Havana only two per cent of nicotine is found. He advises smokers to guard against the baneful effects of nicotine, by placing in the tobacco-pipe a bit of cotton impregnated with tannic and citric acids, which will arrest the alkaloid and form tannate and citrate of nicotine.

### WELDING IRON.

M. Lietar, of Brussels, has described a new method of welding iron or steel, or iron with steel. He calcines and reduces to a fine powder, one kilogramme of iron or steel filings, one hundred grammes of ammoniac, sixty grammes of borax, and fifty grammes of balsam of copaiva. One of the pieces of iron or steel to be soldered, is brought to a red heat, and, after being cleaned with a wire brush, the powder is spread upon it, and the other piece of metal, at a white heat, is brought in contact with it; thus a perfect welding is effected.

### A GREAT BALLOON.

At the Paris Exposition a balloon, in the form of a perfect sphere, and about two hundred and ten feet in circumference, is held by a cable, and makes hourly trips upward, in the same manner as worked in a model at the last exhibition by the American Institute, and as operated on a large scale at the New York Central Park. The balloon is to be filled with hydrogen, the most buoyant of the gases, which will be made by decomposing steam by means of red-hot charcoal. By this process, it is said hydrogen gas can be furnished at about two dollars and seventy-five cents per one thousand cubic feet.

### INCREASING THE SUPPLY OF WELLS.

Mr. Donnet, a civil engineer of Lyons, France, has patented a method of increasing the quantity of water in wells which cannot be easily made deeper. It is simply to cover the top of a well air-tight, and to exhaust the air by a pump, thus making the atmospheric pressure assist the water in its percolations. The height of the water in the well, within thirty-three feet, will depend on the relative vacuum obtained. Another pump, inserted through the covering and reaching the water, will draw it in the usual way. It is not claimed that there is any saving of power by this mode of operation.

### DRAWINGS ON POLISHED AGATE.

The curious figures sometimes found on agate may be imitated by drawing the design with a common goose-quill, wetted with a strong solution of nitrate of silver, and exposing it to sunlight. At first the color will be brown, but if retouched two or three times, it will become reddish. If the solution contains one-eighth of common soot and one-eighth of bi-tartrate of potash, it will give a grayish-brown color. A violet color is obtained by substituting alum for the two substances last named. A solution of chloride of gold gives a light brown color, and nitrate of bismuth white and opaque appearances. These colors are unaffected by the atmosphere; they will reappear after washing when exposed to sunlight.

### A WINTER LANDSCAPE.

In Germany materials are put up and sold for making an interesting chemical experiment. They consist of a solution of nitrate of lead, one part; and water, three parts; also, of sal ammoniac (chloride of ammonium) in fragments of about the size of small beans. The solution, which is a colorless liquid, is poured into a bottle or glass to the depth of, say, two inches, and then pieces of sal ammoniac are dropped in to cover the bottom. A double decomposition takes place, and a white crust is deposited, forming miniature representations of trees, grasses, and rocks covered with snow. Those who intend to repeat the experiment must bear in mind the fact that the nitrate of lead is poisonous.

### A MINIATURE VOLCANO.

Prof. Choutard, filling the chair of Natural Philosophy at Nancy, France, has devised the following experiment, showing the power of Ruhmkorff's induction coil. A quantity of the flowers of sulphur is mixed with a small proportion of iron filings, or, better still, with iron reduced by hydrogen, in which case it is in quite an impalpable state; zinc and copper filings may also be added in small quantities. The mixture, made as complete as possible, is placed on a pane of glass or a dry brick, so as to form a heap two or three centimeters high, and much longer than broad. The ends of the wires of a Ruhmkorff's apparatus are inserted into the heap, so as to be two or three centimeters distant from each other. When ready, a current of electricity is sent through the coil, and instantly a violent explosion takes place. A sort of crater is formed, whence magnificent sheaves of fire are seen to issue, displaying colors like a bouquet of fireworks. It is in reality a volcano, on a very small scale, having its subterranean noises, as it were, and ejecting boiling lava.

### KRUPP'S GUN.

The great cast steel gun exhibited by Krupp, of Essen, at the Paris Exposition, weighs, including the breech, fifty tons. The weight of the breech-piece is 15 cwt. The diameter of the bore is fourteen inches, and the total length of the barrel is seventeen and a half feet. It is rifled, and contains forty grooves one-fifteenth of an inch deep. It carries a solid shot weighing 1,100 Prussian pounds, or a steel shell weighing 981 pounds. Weight of powder charge, from 100 to 120 pounds. The gun-carriage weighs fifteen tons, and will turn upon a turn-table now in the course of construction, the total weight of which will be twenty-five tons. This can be worked by two men. The cylindrical tube forming the piece is made of a solid forging of steel. Three superposed rings or cylinders of different lengths, weighing thirty tons, are shrunk upon the central tube, which weighs twenty tons. To manufacture this gun, work was carried on night and day for sixteen months. It was brought to Paris on a railway truck made at the same works specially for this purpose. The price of the piece, including the carriage, is 145,000 Prussian thalers, or $105,270.

### PURE DISTILLED WATER.

Stas, in his researches regarding atomic weights, to obtain perfectly pure water, destroyed the volatile organic matter which is liable to become fixed, by passing the vapor of water slowly through a long tube of copper filled with roasted copper turnings; the water condensed from this vapor was redistilled in a platinum refrigerator. However, finding this process too slow, he devised a quicker method, by which a person may produce water in which it is impossible to discover the slightest trace of organic matter. He mixed pulverized manganate of potassium with the smallest quantity of water necessary to dissolve the whole, and lets it rest in a closed vessel. Four or five per cent of the solution, which becomes of a clear and deep green color, is added to the water to be distilled. After the mixture has been left for twenty-four hours, he puts in the retort with it a litre or two of concentrated solution of manganate of potassium, and an equal volume of a solution of hydrate of potassium, sufficiently concentrated to give stability to the salt, and to enable its dilute solution to resist for a longer time the action of heat without decomposing. The retort is filled to about eight-tenths full of the prepared water, and the whole is distilled in the usual way. When rain water is used, the ammonia is not removed by this process, and it is essential to redistil it, with some thousandths of mono-sodic or mono-potassic sulphate.

### THE GREAT PYRAMID.

Mr. C. Piazzi Smyth's new work in three volumes, containing an account of his operations in Egypt during the first four months of 1865, just published, has again directed attention to the pyramids. Herodotus, Strabo, Pliny and the Arabian writers all concurred in the statement that the great pyramid was originally covered with a white casing. For many years this statement was not believed, because no traces could be found. However, in 1837, Col. Vyse found two casing stones *in situ.* They were of white limestone, from the Mokattam hills. As early as the year 1000, the Kalifs of Egypt began to strip off this casing. The blocks, measuring eight feet by five, were used in building palaces, mosques and bridges. Those which remained were near the foundation, and covered with sand at the time of the devastation alluded to. They were cut so true that a cement no thicker than ordinary paper was required to join them. The true angle of the pyramid's shape was determined by means of the remaining casing; as measured by Prof. Smyth, it is 51° 51′ 14.3″. The base of the pyramid is a square, each side being seven hundred and sixty-four feet, and the original height of the pyramid was four hundred and eighty-six feet. Mr. John Taylor was the first to discover that the height bore the same relation to the sum of two sides of the base as the diameter to the circumference of a circle, carrying the fractions to only two figures, the proportion being thus expressed:

486 : 1528 : : 1 : 3,14.

### LIGHT-HOUSES AT PARIS.

In the park of the International Exposition is a first class light-house, and there is another on the banks of the Seine, just above the bridge of Jena. The largest is about one hundred and sixty feet high, and stands on an island in a small lake or pond. The structure is of iron, and contains a staircase with two hundred and fifty steps. The lantern is six feet in diameter and eight and a half feet high. Its light could be seen at sea from a distance of thirty-six miles. It is to be finally placed on an elevated point of the Roches Douvres, an island between the Isle de Bréhat and Guernsey, about twelve leagues from the port of Portrieux. The mode of illuminating the pharos now generally used, is the dioptric system of the celebrated Augustin Fresnel, who first demonstrated that the undulations, producing light, move in a transverse direction to the line of the ray. This system consists of zones or segments of glass surrounding the central flames, whose focal rays are parallel, and horizontal in direction. In fixed lights the deflection is only in meridian planes, the natural divergence in azimuth being unaltered; but in the revolving lights the focal rays are gathered into a number of cylindrical beams, each of which, by the rotation of the apparatus, are brought to the eyes of an observer.

### NEW JERSEY MARL.

The remarkable deposit of green sand, misnamed marl, extending from the Atlantic ocean, near Sandy Hook, for many miles, in a southwest direction, is now very extensively used as a fertilizer. It contains but very little of the constituents of ordinary marl, that is to say, carbonate of lime and silicate of alumina; however, portions of the great marl district designated as yellow marl, consist mainly of carbonate of lime. The green sand varies in its composition in different localities. That in Monmouth county, particularly in the Squankum district, contains the largest percentage of phosphoric acid. About one-half its weight consists of silica or pure sand, nearly one-fifth of protoxide of iron, one-tenth of water and organic matter, and one-twentieth of alumina and magnesia. The remaining fifteen per cent embraces, according to the analysis of Prof. Eaton, 7.2 per cent of potash and soda; 3.3 lime; 4.54 phosphoric acid; .34 sulphuric acid; .32 soluble silica. In relation to the more essential constituents, this analysis agrees with that by Prof. Cook, of Rutger's College, the State Geologist.

The effect of Monmouth marl on sandy soils is strikingly displayed at Long Branch. In front of the Continental Hotel, and within twenty-five rods from the ocean, is now to be seen a luxuriant growth of grass, partly the result of marl. Green sand is said to have wonderfully stimulated the potato crop in Monmouth county. Lands which were formerly thought unworthy of cultivation have, by the application of this fertilizer, been transformed into the most fruitful and productive portions of New Jersey. Farmers flock from all directions to the marl pits, and it is said not less than eighteen hundred wagon loads have been collected in a single day.

The facilities for procuring the green sand have been greatly increased by the construction of the Raritan and Delaware Bay railroad, from which a branch now extends to the works of the Squankum Marl Company. Here the marl is found in the bed of a tributary of the Manasquan river, about ten feet below the surface. Through the energy and foresight of Mr. O. B. Kinney, all the difficulties in digging, formerly experienced by the presence of water, have been obviated. A steam dredging machine, of eighteen horse power, now floats in a canal of its own construction, and every minute a ponderous bucket descends to the depth of twenty-six feet and brings up ten bushels of the dark green sand, which, by a side motion, is dropped into a railroad car on the bank. By this arrangement, neither pumping nor draining is required. The apparatus, guided by two men, does the work of hundreds of hands, and enables this company to deliver the fertilizer near their pit at the rate of three cents per bushel. Its average cost at various points on the railroad, extending from Port Monmouth to Philadelphia, is eight cents per bushel. By means of this and other fertilizers obtained from the ocean, the great wilderness, which formerly extended from Raritan to Delaware bay, is being rapidly brought under culture, and it is safe to predict that within twenty years the whole will present the appearance of a continuous garden, and that it is destined to be the principal source for supplying both New York and Philadelphia with fruit and vegetables.

### CHROMATE OF DIABENZOLE.

This compound is said to surpass the fulminate of mercury in explosive force. Mr. Griess, the French patentee, makes this body by mixing one equivalent of hydrochlorate of aniline with two of hydrochloric acid, gradually adding to the mixture one equivalent of nitrate of soda in strong solution. When nitrogen gas is no longer evolved, the remaining diabenzole is extracted by one equivalent of bi-chromate of potash in strong solution, and one of hydrochloric acid, which causes a precipitation of chromate or chlorochromate of diabenzole, which must be dried with extreme caution.

### PHOTOGRAPHS.

The portraits made by Adam Salomon are admitted to have no equals in the Paris Exposition. *The London Photographic News* says the secret of his extraordinary success lies in the long exposure which he gives. He uses a rather acid bath, sufficient to insure a perfectly clear picture, and then gives plenty of time. His printing is alleged to be one source of his superiority. It is suggested that he uses paper the moment it is ready, carefully avoids any exposure of it to light, and produces remarkable effects by exposing the print after it comes from the frame to the light for a short time, protecting the face and hands, thereby obtaining a remarkable purity of tone in the flesh.

### PUPILLOMETER.

By the aid of the apparatus invented by M. Houdin, any one can measure the diameter of the pupil of his own eye. It consists of a thin copper plate pierced with two holes, one of which is fixed and the other movable. An index is attached to the plate, and at the end of a small tube, for the purpose of preventing light from entering the eye except in one direction. On placing the instrument to the eye, the holes are made to coincide, so as to form but one impression upon the retina; but when changed from this position, two pupillary disks, having the same diameter, form upon its surface. This diameter is ascertained by making the two images approach each other until they become tangential. The distance between their centers is the diameter of the pupil; this is at once indicated by the graduated index.

### HYBRIDIZING FRUITS.

*The Journal of the Royal Horticultural Society* contained sometime since an account of experiments made by John Sandish, florist, in hybridization, which were confined to greenhouse grapes and fruits. He raised five hundred grape seedlings, and fruited four hundred sorts. One of their most successful experiments was with the Muscat of Alexandria, bearing an oval grape, very difficult to cultivate; and the Trovéren, bearing a round grape, and a remarkable free grower. The former was made the female parent. The best result of many experiments was a large, early black grape, oval in shape, and having the slightest possible taste of the Muscat. The most remarkable case was a perfect miniature of the Muscat of Alexandria, perfectly oval, with the strongest Muscat flavor, but in size not larger than a red currant.

He succeeded in obtaining peaches with nectarine flavor. The nectarines, made the female plants, were the Violette Hative, Pitmaston Orange, and the Stanwick, crossed with the Noblesse and Barrington peaches. Although the Violette Hative nectarine had a small flower, still, when crossed with the large flowering peaches, eight out of twelve were large flowered; and out of fifteen kinds, fruited in one summer, only one was a nectarine; the others were all peaches, most of them with the nectarine flavor.

### A NEW GREENHOUSE.

The new greenhouse constructed in England by Mr. Beard, is composed of iron and glass, and rests on an iron wall-plate, which may be elevated on a wall, or placed on smooth solid basis of concrete. The water-troughing constitutes the roof plate. The roof dips into and rests on this plate, and consequently removes the water condensed on the internal surface of the glass, as well as the rain from the outside. The upright supporting pillars are hollow tubes, which can be stopped at pleasure, or used in the conduction of rain water into tanks, according to the plan first introduced by Mr. Bogardus, of New York, the inventor of the cast-iron house. A ventilator, worked by an endless screw, extends the whole length on the top of the house, and is set at a greater pitch than the remainder of the roof. It opens outward on each side, thus forming a double ventilator. A series of balanced ventilators are placed on each side near the base of the building, through which air is admitted. The glass is inserted into a T shaped iron rib, and on each side of the edge of the glass is placed a strip of asphated felt, which is held in its place and made tight by a plate and screws. This arrangement supersedes the use of putty. The iron is not painted, but is covered with a flux, which is baked on before the pieces are put together, thus forming a durable enamel. This structure is comparatively cheap, and not liable to need many repairs.

### CRANBERRY BEDS.

The production of the cranberry in Eastern New Jersey is worthy of remark. In Ocean county alone the cultivated cranberry beds cover an area of more than one thousand acres. The most approved plan of making a bed is to select a bog or low piece of ground, which can be easily flowed with water and drained to the depth of two feet, and after turning under the sod and pulverizing the surface, to cover the whole with white sand to the depth of six inches. The plants are placed about eighteen inches apart. They must be kept clear of weeds, and in the course of three or four years the whole surface will be covered with the vine. By means of a dam, the bed is kept under water about one-half of the year; this plan effectually checks the ravages of the worm. The crop may be gathered in the fall, or if covered by water during the winter, in the spring. The average yield per acre in New Jersey is about one hundred bushels, and the average price per bushel about three dollars. After the bed begins to bear, the production of the berry is attended with less care and trouble than any other crop. Unlike other berries, it can be preserved without difficulty for a long time; the market, too, is seldom over-supplied. Large qnanties are used on shipboard, and the foreign demand is constantly increasing. A bed of the first quality is generally held as high as one thousand dollars an acre. The American cranberry—of which there are three varieties well known to dealers, the Bell, the Bugle and the Cherry—is much larger than the English cranberry. In some of the restaurants and other places in Paris, where condiments and preserves are sold, the American cranberry now has a conspicuous place.

### BLANCHING OF THE HAIR.

A paper, read before the Royal Society, London, by Mr. Erasmus Wilson, has thrown new light on the question as to what causes the sudden whitening of the hair, often produced by fright or profound grief. He cites a case in which the hair was colored white and brown alternately from end to end. The white segments were about one-half the length of the brown, and the two together measured about one-third of a line. Under the microscope the colors were reversed, and it was obvious that the opacity of the white portion was due to a vast accumulation of air globules packed closely together in the fibrous structure of the hair, as well as in the medulla. There was no absence of pigment, but the accumulation of air-globules veiled and obscured the normal color and structure. Mr. Wilson suggested the possibility of the brown portion being the day growth, and the white portion the night growth. He also said, in reference to the sudden blanching of the whole hair, of which there were many cases on record, that during the prevalence of a violent nervous shock, the normal fluids of the hair might be drawn inward toward the body, in unison with the generally contracted and collapsed state of the surface, and that the vacuities left by this process of exhaustion might be suddenly filled with atmospheric air. An interesting discussion followed the reading of the paper. Dr. Sharkey alluded to a recent case of sudden blanching of the hair, reported by Dr. Landois, of Griefswald, in *Virchow's Archiv*, which was ascertained to be the result of an accumulation of air-globules in the fibrous substance of the hair.

### CARAMEL COLORS.

A correspondent of *The London Chemical News* says the dark color given to vinegar by caramel, may be obtained by mixing 120 pounds of glucose with six pounds carbonate of ammonia and six pounds of water. Heat together in a metal boiler till the glucose has attained the desired color, keeping the mixture well stirred;

then add thirty or forty pounds of warm water, poured in a thin stream.

### EARTH EATEN IN BORNEO.

A sample of a kind of clay eaten by some of the lowest class of natives in Borneo, was sent to Batavia for analysis; the following is the result:

| | | |
|---|---|---|
| Pit cool rosin (organic matter, volatile at a red heat)... | 15.4 | per cent. |
| Pure carbon........................................ | 14.9 | do |
| Silica .............................................. | 38.3 | do |
| Alumina............................................ | 27.7 | do |
| Iron pyrites........................................ | 3.7 | do |
| | 100.0 | do |

### ALUM CRYSTILIZATIONS ON FLOWERS.

A correspondent in *The American Journal of Pharmacy* describes a plan for making a beautiful parlor ornament. Wrap baskets of pliable copper wire with gauze. Into these, at the bottom, tie violets, ferns, geranium leaves, chrysanthemums—in fact, any flowers except full-blown roses, and sink them in a solution of one pound of alum to the gallon of water, after the solution has cooled; as the colors will then be preserved in their original beauty, and the crystalized alum will hold faster than when from hot solution. When a light coating of distinct crystals has completely covered the articles, remove carefully, and allow them to drain for twelve hours. Flowers are thus preserved in their beauty and freshness for a long time.

### NEW PROCESS FOR EXTRACTING POTASH.

M. Tessié de Mothay, of France, has succeeded in producing on a large scale, fluoride of silicium (*akef*) and fluosilicic acid (*alakif*). By the action of this acid on the chloride of potassium of the Strasfurth mines, he extracts caustic potash and the carbonate of potash, and with the facilities he now has he expects to soon deliver to the trade at a cheap rate, one ton of potash per diem. The first process depends on the reaction which takes place when two equivalents of silica (*aket*), three equivalents of fluoride of calcium (*calcamef*) and four equivalents of carbon are melted in a closed crucible. At about the melting point of iron it was found that a large quantity of fluoride of silicium was evolved, and analysis proved that the fluoride of calcium had parted with more than half of its fluorine. The process used by Tessié de Mothay and Kescher consists in: 1. Kneading carbon with a mixture of silex, clay and fluoride of lime, in proper proportions, and by fusion in a blast furnace, forming a bibasic silicate of alumina and lime. 2. Mixing the cakes with the proportion of coke necessary for their fusion. 3. Supplying the furnaces through a double chamber, to prevent the escape of the gases. 4. By means of an intense heat, produced by blowers, to melt the cakes, and collect the gases in condensers, which are continually wetted on their surfaces, so that, by the direct contact of water, the fluoride of calcium is decomposed and converted into hydrosilicic acid.

## FOOD AND ITS DIGESTION.

An interesting paper with this title, by Dr. Howard Townsend, appears in the Transactions of the Albany Institute, just published, from which the following is condensed: A necessary condition of estimating the value of any substance as an article of food, is its *digestibility*. A vegetable or an animal tissue may contain an abundance of albuminoid, or of starchy matter, and still at the same time be of such unyielding consistency as to be insoluble in the digestive fluids, and therefore useless as an article of food. Consequently, any process which softens and disintegrates a hard alimentary substance, renders it more digestible, and increases its value as an article of food. The preparation of food by cooking, therefore, is a very necessary process, though doubtless in its refinement too often is its good perverted. Two objects are accomplished by cooking: First, the food is softened and disintegrated, so that its particles may be more fully and effectually acted upon by the gastric juice in the stomach; and again, by the process of cooking, generally an agreeable flavor is imparted to the food, which flavor stimulates the gastric follicles to pour out an increased flow of their digestive fluid. By a chemical analysis of food we gain much positive information as regards the nutritive qualities of the different kinds which we use; and, by our advances in physiological knowledge, we have learned much in reference to the adaptability of food to the different requirements of the system; and yet, for much valuable information we have had to rely upon fortunate experiments, such as Dr. Beaumont, of the United States army, performed upon Alexis St. Martin, a Canadian, who was wounded by an accidental discharge of his gun at Michilimackinac, Michigan, in 1822, while Dr. Beaumont was stationed there, and under whose charge St. Martin was placed. Though the contents of the gun made a perforation through the walls of the stomach, the man survived, but this perforation was never closed; consequently, through it Dr. Beaumont was enabled to make his examinations, and perform his interesting and valuable series of experiments. Introducing the various kinds of food through this aperture into the stomach, and then watching the result of the digestive process, he ascertained many valuable facts (given by him in detail in a volume devoted to this subject). For example, in the digestion of vegetables, for rice boiled, only one hour was required, while for boiled cabbage it took four and a half hours to complete its digestion. For venison steak, broiled, one hour and thirty-five minutes; for pork, five hours and fifteen minutes; for roast beef, three hours; for milk, boiled, two hours; for milk, not boiled, two hours and fifteen minutes; for chicken, fricaseed, two hours and forty-five minutes; for turkey, roast, two hours and thirty minutes; for ducks, roast, four hours; for potatoes boiled, three hours and thirty minutes; for potatoes, mashed, two hours and thirty minutes; for bread, three hours and thirty minutes. It is exceedingly interesting to compare the result of these experiments, performed by Dr. Beaumont upon Alexis St. Martin, and observe how closely that result coincides with the instructive experience of mankind. The Indian, and also the hunter, has often been heard to remark—without ever having had the opportunity of looking into the stomach—that for the toil and hardship of a long tramp, he must have something which would "last him longer" than the meat of the deer, which Dr. Beaumont found was digested in an hour and a half; and surely no ocular demonstration is necessary to prove to one who makes the essay, that pork and boiled cabbage require a longer time and greater effort of digestion than roast beef and potatoes; the experience of the sensations is sufficient. In animals, the food required must undergo a process of digestion or liquefaction before it can be absorbed, the general characteristics of which, in all cases, are the same. Digestion is accomplished in the alimentary canal, where the food is brought under the action of certain digestive fluids, which liquefy and dissolve it. These fluids are the secretions from the mucous membrane of the alimentary canal, and those glandular organs contiguous, which pour their secretions into this canal. Because the food, always consisting of a mixture of substances, having different physical and chemical properties, the digestive fluids necessarily must differ materially from each other, each one exerting a peculiar action, which is more or less limited to particular species of food. The different elements of food are digested in different parts of the alimentary canal, by the agency of those different digestive fluids, and by their action the various ingredients of the alimentary mass are successively reduced to a fluid condition, so as to be taken up by the blood vessels, and the absorbent vessels of the intestinal mucous membrane, thus to be introduced into the general circulation.

The action which is exerted upon the food by the digestive fluids is by no means that of a simple chemical solution. It is an actual transformation, by means of which the ingredients of the food are altered in character at the same moment they undergo the process of liquefaction. The active agent in producing this change, in every instance, is an organic principle entering as an ingredient into the digestive fluids, and which, by coming into contact with the food, exerts upon it a catalytic action, and transforms its ingredients into other substances. The newly-formed substances resulting from this catalytic action, are absorbed by the vessels, and finally mingled with the general current of the circulation as blood, by which the system is nourished and sustained. The food, in order to be digested, is acted upon by no less than five different digestive fluids: First, the saliva in the cavity of the mouth; second, the gastric juice in the stomach; third, the bile from the liver; fourth, the pancreatic fluid from the pancreas; fifth, the intestinal secretions from the follicles in the intestinal canal. The saliva acts upon the starchy (carbon and hydrogen) elements of the food, converting them into sugar. This action, though not so marked as the action of the secretions further on in the alimentary canal, is one of no little importance; and, doubtless, some of the forms of indigestion which the physician has to combat in his practice, are a result of the useless expenditure and waste of this secretion in the habit of smoking, and more particularly the habit, almost peculiar to this country, that of chewing tobacco. The *gastric juice* acts upon albuminoid elements, like the gluten in bread and casein in milk. In a healthy human adult the quantity of gastric juice secreted in twenty-four hours probably ranges from ten to twenty pints; its maximum, in an hour, under favorable circumstances, is not less than from six to eight pints. Of the action of the *bile* in the process of digestion, much has yet to be established, but that it exercises a stimulating influence upon the absorbents is fully proven. The secretion from *follicles* of the intestinal canal continue, and complete the digestion of the starchy elements of the food.

As a general rule, the digestive apparatus of the herbivorous animal is much more complicated than that of the carnivora. In vegetable substances, the nutritious matters are frequently present in a solid and inconvenient form, as, for example, in raw starch and the cereal grains, and are almost always entangled among vegetable cells and fibers of an indigestible character. In those cases where the food consists mostly of herbage or grass and leaves, the digestive materials bear only a small proportion to the entire quantity, consequently a large mass of food must be taken, in order that the requisite amount of nutritive material may be obtained. In all these cases, the alimentary canal will be found large and long, and divided into many compartments, wherein the different processes of *disintegration*, *transformation* and *solution* are carried on. In the carnivora the alimentary canal is shorter than in the herbivora, and it presents fewer complexities. The food upon which the carnivora subsist is softer than that of the herbivora, and is less encumbered with indigestible matter, consequently the process of its digestion requires a less extensive apparatus.

### IMPROVEMENTS IN INDIA.

India now contains three thousand miles of railway, and twelve thousand miles of telegraphic lines.

### QUALITY OF GLASS.

The most stable glass is that which contains the greatest number of bases; that is, which has the most conflex composition.

### ALIZARIN.

The coloring matter from madder, after sublimation or exposure to 280° C, no longer give the tints desired by dyers. Koechlin and other chemists are searching for the missing yellow tint.

### CHANGE IN GLASS.

M. Peligot discovered that a piece of St. Gobain glass, which had lost its transparency when placed in a drawer and sustained horizontally by one end, became, after some days, curved by its own weight. This malleable glass was also covered by an efflorescence.

### A NEW RESERVOIR FOR THE CROTON AQUEDUCT.

The Croton Board are constructing a new reservoir about twenty-four miles above Croton dam, and seventy-one miles from the city of New York. The new dam will be seven hundred feet in length, sixty-four feet in depth, and about six hundred feet above tide-water. The capacity of the new reservoir will be nearly 8,370,000,000 gallons. Other important improvements are soon to be added by the Croton Aqueduct Board to the magnificent work under their charge.

### CLEANING GLASS.

A method of cleaning glass, which may answer when other methods fail, is, to dilute the ordinary hydrofluoric acid, sold in gutta-percha bottles, with four or five parts of water; with this, wet a cotton rubber, and apply the rubber to the glass pretty thoroughly; afterward wash the glass until all traces of the acid are removed. The effect of this operation is to dissolve off a very thin portion of the glass, thus leaving a new and bright surface.

### NEW DENTAL SCHOOL.

The corporation of Harvard college have voted to extend the technological department, by establishing a dental school in the University. The faculty will consist of the President of the University, the professors of anatomy and physiology, surgery, and chemistry, of the medical school, and three new professors respectively filling the chairs of Dental Pathology and Therapeutics, of Operative Dentistry, and of Mechanical Dentistry.

### INSTANTANEOUS LIGHTNING.

At the Royal Palace, Berlin, forty thousand wax candles are lighted instantaneously by a single match. The wicks are all previously connected by means of a thread spun out of gun-cotton, and, on being set on fire, seven hundred apartments are illuminated at once. The same method has been employed in lighting Russian churches. The preparatory work of connecting the wicks is so great, there is really no such saving of labor as in the case of lighting gas-burners by means of the electric current.

### NEW PROCESS FOR MAKING STEEL AND WROUGHT IRON.

Mr. Siemens, of England, has patented a process for making steel and iron directly from the ore, which differs from that introduced by Mr. Rogers in New Jersey, several years ago, only in the substitution of rich hydrocarbons for pulverized charcoal. The iron ore, in a finely divided state, is heated in a closed vessel, and brought in contact with hydrocarbon currents, which percolate through the mass of ore and unite with the oxygen of the ore, thus reducing the metal.

## ELEVATION OF BUILDINGS.

The great grain elevator at Milwaukee, Wis., is to be raised several feet, in the manner the Fremont House, at Chicago, was raised not long ago. The elevator is two hundred and eighty feet long, eighty-six feet wide, and one hundred and thirty feet high, and is estimated to weigh ten thousand tons. Timbers are placed in four hundred recesses in the foundation of the building, which are to sustain it. Underneath these timbers are placed one thousand six hundred large screws, which are to be turned by means of levers, until the building is brought to the required height, when a new foundation will be placed under it. The cost of the work will be about thirty thousand dollars.

## MAGNETIC AND DIAMAGNETIC EXPERIMENTS.

M. Chantard has reported to the French Academy of Sciences his plan of illustrating the action of an electro-magnet on certain gases. He uses Plateau's mixture of soapsuds and glycerine. To show, for instance, that oxygen gas is magnetic, he forces it through the mixture, thus forming tough soap bubbles filled with oxygen gas. As these pass the poles of the electro-magnet, they are attracted; but when the current is broken, they fall by their superior gravity. By throwing the powerful rays of Hare's lime light on the bubble, the experiment was plainly seen by a lage assembly.

## ESTIMATION OF METALLIC SILVER.

According to Clawson, silver is wholly precipitated from a solution of sulphate of silver by plunging into it a plate of cadmium. The silver is deposited in a compact mass, easily washed with water; to remove any traces of cadmium, boil the silver in the acid liquid until no hydrogen escapes; wash it until the water is free from sulphuric acid; then dry and calcine it. The silver is at first a black gray, but soon takes a metallic luster. On weighing, the result is found to be very exact. When dealing with nitrate of silver in solution, evaporate it to dryness in the presence of sulphuric acid, and then dissolve the sulphate of silver in boiling water, when it will be ready for receiving the metal, cadmium.

## INFLUENCE OF CAPILLARITY ON CHEMICAL ACTION.

M. Becquerel has communicated to the French Academy of Sciences, his series of experiments on the influence of the capillarity on chemical decompositions and combinations. He makes, in a tube having two reversed branches, a fissure of infinitely small width, and pours therein a solution of the nitrate of copper, yet no liquid passes through the fissure; but when the tube is placed in a vessel containing liquid protosulphuret of sodium, electrical action immediately ensues; decomposition and recomposition are manifested by the crystals which appear on both sides of the fissure. The experiments of Becquerel prove that the fissure has a real influence on the nature of the products of decomposition, for the salts formed are not always those indicated by theory.

## NEW RAILWAY SYSTEM.

The Rhenish Railway Company are the first to test, on a large scale, a plan for dispensing with railway ties of wood. They use a nine-inch rail instead of the common rail, which is about three inches deep, thus returning nearly to the form first used by the inventor of the T rail, the late Robert L. Stevens, of Hoboken, N. J. The height of the original rails, made under his direction in England, and after his models for the New Jersey railroads, was about six inches. The nine-inch rails used by the Rhenish Railway Company rest upon a bed of plates, and are then covered with five inches of gravel, on the top of which is a two-inch layer of earth, well stamped down, so that the head of the rail projects only an inch above the surface. Two lines of rails are connected every three feet by round bars of iron, firmly bolted below the surface of the ground, so that the whole appears like a half-buried ladder of iron. A similar method of fastening the rails together and supporting them, was tried some years ago on the Erie railroad, near Paterson, N. J.

## NEW PROCESS FOR BLEACHING.

M. M. Tessie de Morthay and Maréchal, of Mentz, France, are showing at the Paris Exposition specimens of fibers, thread and woven stuffs of cotton, linen, wool and silk, bleached by a new process, which is said to be more expeditious than the old. In bleaching cotton, linen or hemp, all grease or fatty matter is first extracted by an alkaline bath; it is then steeped in a solution of manganic acid or permanganate of soda, with the addition of sulphate of magnesia. After remaining say fifteen minutes, it is placed in alkaline solutions, or into baths containing sulphurous acid, nitro-sulphuric acid, or peroxide of hydrogen, where it remains until the layer of oxide of manganese, which coats it, is entirely removed. It is then washed, and again placed in manganic acid, or in the permanganate of soda, afterward in the alkaline solution, or in the solvents mentioned, and thus the process is repeated until the bleaching is completed. In bleaching wool or silk, the same method is used, except that the alkaline liquid is a weak solution of soap, and the only acid employed is sulphurous.

### WATER SUPPLY FOR LONDON.

Two schemes have been proposed for supplying London with pure water. One is to collect four small streams in Wales, forming the headwaters of the river Severn, in six reservoirs, four of which are to be of large size. From these the water will be conducted through two aqueducts, each twenty miles long, to Masten Mere, when they will unite. From thence the water will be carried to Stanmore and discharged into service reservoirs, two hundred and fifty feet above high-water mark. There would be one hundred and seventy miles of aqueduct and ten miles of large piping. The cost of this is estimated at neary £9,000,000 sterling. The other scheme is still bolder, as it will require an aqueduct of about two hundred and forty miles. Three lakes which receive a part of the rain fall of the Cumberland hills, lying in the northwest corner of England, are to be united, and from Ullswater, the largest lake, it is proposed to make a continuous aqueduct to Harrow, near London, where the reservoir would be two hundred and twenty feet above high-water mark. Neither plan would be brought into competition with the present water companies, whose property would be purchased by the new company. No definite action in relation to either plan has yet been had.

### INFLAMMABLE CLOTHING.

Ladies' light dresses may be made fireproof by means of the tungstate of soda. Although since the introduction of crinoline frightful accidents have been more frequent, no serious attention has been given to any plan for remedying the evil. Quite lately, however, a sudden death, caused by a lucifer match, has prevented the union of the houses of Savoy and Hapsburgh-Lorraine. The Archduchess Matilda, the affianced bride of the Crown Prince of Italy, was looking out of the Imperial Palace at Schönbriim, and in changing her position trod on a lucifer match, which had been negligently dropped on the floor. Instantly her long light dress was on fire, and was not extinguished until too late. After a short interval of extreme suffering, she expired. *The London Lancet* says the public mind is now in a ripe condition for the enactment of the most stringent precautions against fatal accidents from burning; and the warning which was repeatedly sent forth, but in vain, through the sad fate of poor ballet girls, who had ventured too near the foot-lights, will surely take effect now, when an auspicious alliance has been set aside by the most miserable of accidents, and when a lucifer match has proved even more adverse to the pacific relations of two rival powers than the cannonade of Custozza, or the heavy-shotted broadside of Lissa.

Dr. Bradley said when a lady's dress takes fire, she should immediately drop on the floor at full length, and endeavor to check the flame by rolling over; any other person present should immediately cover the burning clothes with a carpet or woolen cloth. In this way he had known of several lives being saved.

### WHEATSTONE'S NEW ELECTRIC MACHINE.

This machine consists essentially of a bar of iron bent in horse-shoe form, around which is coiled a covered copper wire, as in the ordinary electro-magnet. Between the poles revolves a spindle, carrying covered copper wire, insulated, but so arranged that either end will be alternately brought into contact with each terminal of the wire surrounding the iron bar. The spindle is so arranged that during its revolution, on its long axis, it is made to present each side in succession to either limb of the horse-shoe. An endless band passes around the circumference of a tolerably large fly-wheel, and around the spindle, thus giving motion to the latter. When the spindle is revolved rapidly the horse-shoe becomes magnetized, a powerful electric current being induced in the wire helix at the same time; and as the motion is continued, the forces go on acting and reacting until a very high degree of intensity is obtained. This machine differs from Mr. Wilde's in this respect, that in the latter any body to be submitted to the action must form the terminals of a complete circuit, whereas, in the Wheatstone machine, such a body would form a bridge, or short cut, by which the electricity completed its circuit. A small machine, turned by hand, is capable of burning a piece of iron wire thirty inches long, and one-sixteenth of an inch in diameter. A similar result is obtained by making one terminal of iron wire approach the other terminal of copper wire; the iron wire immediately takes fire and burns with a brilliant corruscation. When the current passes between points of prepared charcoal, a beautiful and steady light is produced, showing that an electric light of great brilliancy can be obtained on a small scale with a relatively small expenditure of the power required to give motion to the machine.

### CULTURE OF COFFEE IN TEXAS.

A resident of Titus county, Texas, has made experiments in forcing the growth of coffee. The ordinary grains are placed in water and under the direct rays of the sun. When the shoots put forth, they are transplanted to rich soil.

### IMPROVED SOLDER.

Deville has lately found that the addition of zinc amalgam to ordinary solder, makes it applicable to aluminium bronze, and other alloys and metals, where the mercury in the amalgam would not be objectionable.

### THE HIGHEST FOUNTAIN.

Mr. S. B. Hunt, of Maple Grove, Bennington, N. Y., has conducted the water from a mountain spring through a six-inch iron pipe, three miles long, to a basin one hundred feet in diameter, which is three hundred and twenty-five feet below the fountain head. The water is thrown from the basin to the height of one hundred and fifty-four feet. This jet is said to be the highest in the world.

### THE LONGEST RAILWAY TRAIN.

One train of cars, 3,350 feet long, recently passed over the Lehigh Valley railroad. The load drawn consisted of 275 cars, having an average weight of six tons each, making a total of 1,650 tons. This is said to be the longest train ever moved on any railway, and may be cited as the strongest argument yet made in favor of a solid, smooth, iron track for land transportation.

### TO DETECT WOOL IN SILK.

Wagner has given a chemical test, which depends on the presence of sulphur in wool. The material to be examined is boiled in a strong and pure caustic alkali solution; if wool be present, some sulphide will be formed. This will be revealed on adding to the solution a small fragment of nitro-prusside of sodium, which will produce a beautiful violet color.

### TO SEPARATE SILVER.

M. Condurié finds that by adding zinc to melted argentiferous lead, the zinc and silver form an alloy. After stirring the mixture for some time, the zinc alloy comes to the surface; the zinc is then oxydized by a current of heated air driven over the alloy, and is thus easily separated. The silver is then separated from the lead which was necessarily taken up with the alloy by the ordinary process of cupellation.

## MAGNETISM USED IN MAKING IRON.

*The London Athenæum* says, among the many new applications of electro-magnetism to the arts and manufactures, is that of making it instrumental in the smelting of ore. A fixed electro-magnet is placed opposite an opening in the side of the furnace containing the metal to be smelted, and a current of magnetism is directed on the molten metal. The effect on iron is said to be very remarkable, rendering it hard and tough. The process is carried on with great success at one of the most important iron works in Sheffield.

## POPULATION.

The total population of the earth has been estimated at between 1,200,000,000 and 1,300,000,000 persons. Assuming that 32,000,000 die annually (says *The London Lancet*), the deaths each day would be nearly 88,000; 3,600 per hour, sixty per minute; and thus every second would carry into eternity one human life from one part of the world or another. But reproduction asserts its superior power; for, on calculating the probable annual births on the globe, the result shows that whereas sixty persons die per minute, seventy children are born in the same time, and thus the increase of population is kept up.

## THE FUNCTION OF CHLOROPHYLL.

Dr. F. Cohn, of Breslau, maintains that chlorophyll, or some closely allied body, is contained in all growing plants, and is the principal actor in the process of assimilation; and further, that the quantity present in the lowest forms of plants and animals, controls their motion. They always approach the light, and if various colors are present, they move toward the dark blue or violet in preference to the red, showing that the actinic rays exert more power in this respect than the thermal. If one-half a fragment of chalk is coated over with a resinous substance, and placed in dilute acid, the evolution of carbonic acid from the exposed surface will cause the coated portion to be projected foremost. Dr. Cohn concludes that, in a similar way, the chemical action resulting from chlorophyll, when subjected to light, may produce those axial rotations sometimes manifested as longitudinal motion.

## METROCHROME.

This is an instrument for detecting and estimating the changes of star-colors. As yet, the only changes noted with certainty are in Sirius and 95 Herculis. Heretofore the great difficulty has been in the want of a standard of reference; hence observers have differed greatly in their estimates. The metrochrome of Mr. Kincaid contains a rotating drum with six equidistant apertures; three of these transmit the normal light of the lantern, and the remaining three are constructed so as to admit flat-sided bottles containing differently colored chemical solutions. By wholly or partially covering one or more of the latter apertures, and giving a rapid rotation to the drum, it will be possible to produce a light which, thrown into the telescope, forms the image of an artificial star; this may be varied until it exactly resembles the light of the star under examination. It has been proposed to insert colored glasses or precious stones in the rotating drum. Mr. Kincaid, however, prefers the use of chemical solutions.

### HYDROGEN IN METEORIC IRON.

Mr. Graham, of London, the well-known chemist, has been lately experimenting with red-hot and melted metals, to ascertain their power of absorbing gases. Iron made red-hot by charcoal, absorbs carbonic oxide, carbonic acid gas, and nitrogen; the two first being the products of combustion, and the latter coming from the atmosphere. The gases thus absorbed may, on reheating the metal, be driven off and examined. On submitting a piece of Lenarto meteoric iron to the action of heat, he found that 86 per cent of the gas evolved was hydrogen, its volume being nearly three times that of the fragment of iron from which it was collected. Mr. Graham has found it difficult to impregnate iron, under the ordinary atmospheric pressure, with more than one volume of hydrogen; hence he draws the important inference that the meteoric iron came from an atmosphere composed wholly or mostly of hydrogen; which atmosphere, being very dense, cannot be connected with the light cometary matter moving within the limits of our solar system.

### PHOTOGRAPHING ENGRAVERS' BLOCKS.

It is well known that a picture obtained by the camera is a reverse impression; if this is transferred to an engraver's wooden block, the result will be a right impression, which is the reverse of what is wanted. Engravers, heretofore, have obviated the difficulty by tracing the photographic impression on the wood. Mr. B. F. Taylor, of Philidelphia, dispenses with this additional work by using a reflector, with his camera at an angle of 45°, by which he throws a reverse picture directly on the block to be engraved, and previously coated with a solution containing the following ingredients: Plain collodion 8 ounces; nitrate of silver, 100 grains; chloride of strotium, 25 grains; citric acid, 20 grains. The coating is rendered permanent by immersing the block into a fixing bath containing a solution of hyposulphite of soda. This picture, however, on the wood cannot be literally followed, as the shading is not made by either line or stipple work. The engraver is not a mere copyist, he must use some skill and judgment in cutting his lines so as to produce in the engraving the same degree of shading found in the photograph.

## NEW BUILDING MATERIAL.

Mr. F. Ransome, of England, has produced a new stone, by a very simple chemical action, which had not before been made, because, heat and pressure were essential conditions to the reaction. The newly prepared stone is a silicate of lime which contains three elementary substances, namely, calcium, silicon and oxygen. It is the result of the double decomposition of the silicate of soda (water glass) and the chloride of calcium, which form chloride of sodium (common salt) and the silicate of the oxide of calcium (silicate of lime).

The new material is now manufactured on a large scale, by the Patent Concrete Stone Company, at East Greenwhich, near London. The silicate of soda is made from a sand of a brownish color, found in great abundance near Maidstone, flints and caustic soda. The flints are heated upon iron gratings within a senis of cylindrical iron digesters resembling steam boilers. A solution of caustic soda is added, and the digester is closed steam-tight. The mixture is boiled by means of steam, at seventy pounds pressure, carried from a neighboring boiler, through a coil of pipe within the digester. The flint is thus dissolved, forming soluble glass of about 1.2 specific gravity; this is drawn off and afterward evaporated until it has a specific gravity of 1.7.

The sand after being completely dried, by revolving it in a cylinder through which hot air is forced, is mixed with a small portion of finely ground carbonate of lime, so as to fill more closely the interstices of the sand. One bushel of this mixture is worked up in a loam mill with one gallon of silicate of soda, forming a sticky substance, which has sufficient coherence to be used in molding like the loam employed by the iron founder. After a mold has been prepared, a solution of chloride of calcium is poured over it, and instantly the process of hardening commences. In a few minutes a quite hard stone is formed, indestructible in air, and the common salt resulting at the same time is washed out. After a thorough washing the substance is impermeable to water. The new stone while in the process of hardening, is thrown into a solution of chloride of calcium, where it is boiled for some hours by means of steam pipes passing through tanks. The process expels any air that may have been imprisoned in the material, and doubtless increases the energy of the chemical union.

The material thus made retains precisely the form it received in molding. It may, therefore, be worked into the most delicate patterns while in the plastic state; thus elaborately wrought capitals or other architectural ornaments may be made with the same facility that the plaster of paris is commonly used for copying statuary. In testing the strength of this concrete, it was found that blocks four inches square, which had been made only ten days, required forty-four tons pressure to crush them, while blocks of Bath stone of the same size gave away under fourteen tons. Silicate of lime is not very abundant in nature, although quite large deposits are found in the northern part of the State of New York.

### CRYPTOPIA.

This name has been given to a new alkaloid found in opium by Messrs. T. and H. Smith, of London. The quantity found in opium is very small. The discoverers obtained from four or five tons of opium only five ounces of muriate of cryptopia. The primary form of its crystals is a hexagonal prism. The new alkaloid contains twenty-three equivalents of carbon, twenty-five of hydrogen, one of nitrogen, and five of oxygen.

### LAGO MAGGIORE.

The Italian journals continue to give accounts of land convulsions on the borders of this lake, as well as of the Lago di Garda. Portions of the Tyrolean Alps have been for several months subject to periodical oscillations, which have kept the peasants in a state of great apprehension. Some time ago a village near Lago Maggiore was covered by an extensive landslide. Large masses of rock and earth are continually falling from Monte Balbo, exciting great consternation among the inhabitants of the valley.

### BARLOW'S PLANETARIUM.

In the Paris Exposition, Mr. M. Barlow, of Lexington, Kentucky, is exhibiting his ingenious planetarium, which is designed to give ocular demonstration of the operation of the physical laws of astronomy. When put in motion, by means of a hand crank, it shows the relative position and motions of the earth, moon and inferior planets, for every second, with the phenomena of conjunctions, transits, eclipses, nodes and phases of the moon, the eccentricity of its orbit, as well as that of Venus and Mercury, &c. The sphere representing the earth is covered with a map of the two hemispheres, surrounded by a meridian and equator, which always maintain their true relative position to the sun. Instructors, by its use, may give their scholars a clear idea of the changes of the seasons, and of the length of days and nights in different latitudes, and other interesting astronomical phenomena.

### SEPARATION OF TIN AND ARSENIC.

Professor Wöhler's method is based on the solubility of sulphide of arsenic in bisulphate of potash, which does not dissolve the tin. The mass, after being oxydized by nitric acid, is allowed to digest with sulphur and caustic potash till the solution is complete. The liquid, after being treated by sulphurous acid in excess, is allowed to rest for some time, and is then evaporated until all the sulphurous acid is driven off. The sulphide of tin is then removed by filtration, and washed with a strong solution of common salt, which may be removed from the precipitate by an acid solution of acetate of ammonia. The sulphide of tin is converted into oxyd of tin by roasting in contact with air. Arsenic may be precipitated from the arsenious acid contained in the liquid, by a current of sulphuretted hydrogen.

### CURE FOR DRY ROT IN WOODEN STRUCTURES.

Mr. Junker, the manager of the alkali works at Saaran, in Silesia, has discovered that tank-waste, the great nuisance of all alkali works, is an excellent remedy against dry rot in wood. This kind of decay is the work of the spores of a fungus (*merulus lacrymans*), which generally find their way through the soil, and are sometimes carried by currents of air. The tank-waste is said to arrest their action in half-decayed wood. It may be used by mixing with other material, so as to form a solid mass, which will harden like the ordinary tank-waste floor. If the mixture called tank-waste is the soda-waste described in chemical works, it is chiefly composed of calcium compounds, about one-third of soda waste being oxychloride of calcium. In England, where the business of making soda-ash and pure carbonate of soda is carried on more extensively than in any other part of the world, the tank-waste of alkali works is given to any one who will cart it away.

### ARTESIAN WELLS IN ALGERIA.

About ten years ago a military corps of French engineers commenced boring for water in Algeria. With two or three exceptions, every boring has succeeded. In 1865, seventy-five wells were delivering 4,200,000 litres of water per hour. The water is limpid and drinkable, but slightly brackish. The effect of these wells on the desert is remarkable. Around each is a village with date plantations, and the natives finding themselves in possession of something worth protection, no longer indulge their predaceous propensities, but incline to a life of peace. In the Ouled Rir district thirty wells have been bored, at a cost of 400,000 francs, which has been paid by a tax on the natives. The shallowest well is about one hundred feet deep, and the deepest nearly six hundred. This district now contains 150,000 date trees, and more than 2,000 gardens. Four brigades of borers, well provided with implements, are now making explorations and sinking wells in localities which are likely to yield water.

### CHEMICAL CALCULUS.

Sir Benjamin C. Brodie, Professor of Chemistry in the University of Oxford, has recently delivered a lecture "On the mode of representation afforded by chemical calculus, as contrasted with the Atomic Theory," in which he assumes as his unit that portion of ponderable matter which, at the melting point of ice, and at a pressure of seven hundred and sixty millimeters of mercury, occupies a space of 1,000 centimeters. To denote units of chemical substances, he uses Greek letters as symbols, and in such a manner as to indicate that nitrogen, phosphorous, chlorine, bromine, iodine, and several other so-called elementary substances, are compounds, containing hydrogen in combination with unknown elements. It is claimed that this system shows there are three, and perhaps four, fundamentally distinct classes of elemental bodies; the first may be represented by hydrogen and mercury; the second by oxygen and sulphur; the third by nitrogen and chlorine. The only novelty in this classification is the grouping together of elements of widely differing "atomicity." What advantage may be gained by assuming that substances not yet decomposed are compounds, and using symbols of volumetric units as a more mathematical form of expression, the author has not yet satisfactorily shown.

### CAUSES OF DEAF-DUMBNESS.

Dr. Peet, Principal of the New York Institution for the Instruction of the Deaf and Dumb, gives, in *The Herald of Health*, statistics from which he deduces the striking conclusion that in Europe, generally, the chances of the birth of a deaf-mute child are more than twice as great as in the United States, or six hundred and fifteen in a million there, against two hundred and seventy-eight in a million here; while the chances of the loss of hearing after birth are in Europe, except in Germany, much less than in the United States, to wit: one hundred and fifty-four in a million there, and two hundred and twenty-two in a million here. Such statistical results as these form the data from which we must study the cause of deaf-dumbness. This striking contrast between the old world and the new may be owing, in part, to climate; in part to the severe out-door labors imposed on women of the laboring classes in many countries of Europe; in part to idiosyncracies of race. The European returns which show such a preponderance of congenital cases, are chiefly from countries where the bulk of the population is of the Celtic and Latin races. We have very few such returns from European populations of the Anglo-Saxon and Teutonic races, and most of those we have agree with the American returns in presenting a large proportion of accidental cases. The causes of congenital deafness are as yet but very imperfectly understood. When deafness is the apparent result of a known disease or accident, it is comparatively easy to judge with probability of the mode of operation; but in most cases of congenital deafness we are left wholly in the dark, even as to the condition of the organs of hearing. They are too deeply seated for more than a very superficial examination in life, and opportunities for dissection of subjects known to have been deaf-mutes rarely occur.

The remote causes that have been, with most probability, assigned for congenital deaf-dumbness, are the following:

1. Unequal ages of the parents, especially where the mother is older than the father, or advanced age of either parent, especially of the mother.
2. Ill health and feebleness of constitution in one or both parents, especially where there is a hereditary tendency to scrofula.
3. Impairment of the procreative power, especially in the father, through early dissipation or bad habits.
4. Intermarriages of blood relations.

5. Causes operating during gestation, through the excited imagination or nervous sensibility of the mother.

6. Ill health of the mother during gestation, or physical accident during that period.

7. Intemperance in one or both parents about the time of conception.

8. The influence of unhealthy occupations, bad water, inferior diet, or damp dwellings of the parents, on their offspring.

9. Direct hereditary transmission.

All these primary causes, the intelligent reader will see, are, *mutatis mutandis,* as applicable to other congenital infirmities, as well as to deaf-dumbness. A defective bridge gives way at its weakest point; and where there is no specially weak point, the point of fracture may be determined by slight causes. So it seems there are families in which the weak point of the constitution is the apparatus of hearing; but in many cases the tendency to deafness, rather than to idiocy, blindness, lameness, or some other infirmity, was biased by causes that often baffle research, because they seem so slight that they elude attention.

### TIN IN MISSOURI.

The reported discovery of numerous veins of tin ore in the county of Madison, Mo., is causing great excitement among speculators in mineral lands. If reports be true, we must regard this discovery as one of the most important events in the history of American mining. Tin has long been sought for, but thus far the few veins found have been too small to warrant their being successfully worked. Some hopes were entertained that the vein at Jackson, N. H., would be favorably developed. Very little tin has, however, been found in that locality. At a later period it was expected that tin would be found, in paying quantities, on the Pacific coast; yet no tin is now exported from California. Our principal source of supply has been the Cornwall mines of Great Britain, which yield about six thousand tons of tin annually. Bolivia, South America, exports about three thousand tons; the Island of Banca, in Asia, four thousand; the Peninsula of Malay, one thousand; and Australia, one thousand. On the continent of Europe, two mines are now opened in Bohemia, one in Saxony, three in France, one in Sweden, and one in Siberia. These, as well as the Spanish mines, which are as old as those of Cornwall. do not yield a surplus for exportation.

Tin (called in chemical works by its Latin name, *stannum*) is one of the seven metals used by the ancients. In the form of bronze (an alloy of copper and tin) it was known to the Egyptians, Hebrews and Greeks, who probably bought it in India. The Phenicians, at a later period, brought tin from the British Isles.

Tin is a white metal of high luster. It melts at about 450° F. At the temperature of boiling water it is very malleable, and may be rolled into sheets not exceeding one-thousandth of an inch in thickness. At ordinary temperature it is not readily tarnished by oxidation, but at a high heat it rapidly combines with the oxygen of the air, and burns with a brilliant white light, forming, as the product of combustion, binoxide of tin.

The chief value of tin consists in the power of resisting ordinary atmospheric changes, and remaining more inert than other common metals, under the action of water. For domestic purposes, tin ranks in utility next to iron. In fact, the combination of these metals, in the form of tinned iron plate or sheets, makes the material from which is manufactured the tin ware found in every American kitchen. Copper vessels coated with tin are also important implements in the culinary department. Tinned iron is largely used, especially in cities, for roofing.

One of the most valuable applications of tin is for making water pipes. Pure tin does not bend easily, and is found less valuable for tubes than its combination with lead in the form of tin-lined lead pipe.

The ordinary tin foil now used as wrappers, in place of paper, is a union of very thin sheets of lead and tin.

Tin takes part in many valuable alloys. It is a component of britannia ware, pewter, common solder, gun metal, bell metal, and bronze. With about twice its weight of copper it forms the speculum metal employed in making reflectors for telescopes. With mercury it gives an amalgam much used in "silvering" mirrors. The chlorides of tin are of great service to the dyer and calico printer. Binoxide of tin has been used in making enamel.

With regard to the extent and precise value of the tin ores of Missouri, we have as yet but little reliable information. Several mineralogists of acknowledged ability are now making explorations, from whom we may soon expect more precise statements. The percentage of tin is not probably large, if we may judge from the yield of a single specimen; but the quantity of the ore and the ease of working it, may make up for its leanness.

The importance of this metal may be appreciated by the statement that the United States imported from Great Britain, last year, $7,000,000 worth of tin and tin compounds, about $6,000,000 ot which represented the value of tinned iron plate sent to our markets.

### BLACK BAND ORE.

It is well known that the cheapest iron made in England is from black band ore, or carbonate of iron. A large outcrop of this kind of ore has been lately discovered in the great anthracite coal basin of Schuylkill county, Pennsylvania. It has been estimated by mining engineers that iron can be made from this ore at a prime cost of ten dollars per ton.

### RAIN ON THE ATLANTIC SLOPE.

The spring and summer of 1867 have been remarkable for rainy weather south of the Highlands. At the city of New York, from the first of February to the tenth of August, there have been twenty-six snowy and ninety-six rainy days, the duration of the actual raining being equal to about twenty-six days. The total amount of water which fell as snow and rain during the whole time exceeded forty inches in depth.

### NEW USE FOR ALUMINIUM BRONZE.

Mr. Hulot, director of the workshops where postage stamps are manufactured, at the Imperial Mint of France, having found that steel was rapidly deteriorated by gummed paper, substituted aluminium bronze with entire success. The three hundred steel perforators used in piercing postage stamps became blunted after a few weeks of use, yet the new tool, containing perforators made of aluminium bronze, at ten per cent, has been striking 126,000 blows per day for several months past, and yet shows no signs of deterioration.

### SANITARY CONTRIVANCES.

*The Union Médicale* contains a flattering notice of the inventions intended to alleviate the condition of the wounded on the battle-field, which are seen in the United States department of the Paris Exposition. The "hospital car" is fully described, and all nations are advised to take pattern from it in the arrangement of drugs, medicines, flasks and boxes for transportation. Everything fragile is protected. No shocks, overturnings, or other accidents, can break the bottles or force out their stoppers. It says the transportation of those who have been operated on, from ambulance to hospital, on the part of each nation is formally installed only in the United States.

### INSTANTANEOUS PHOTOGRAPHY.

A correspondent of *The Camera Obscura* remarks that the production of instantaneous photographs depends upon the excellence of the apparatus and chemicals employed, and rapidity of manipulation, rather than on the practice of any theory or process. The plate should be exposed as soon as possible after its exit from the silver bath, and developed immediately after exposure. The object to be photographed must be lighted as strongly as possible, and if direct sunlight is not present, all false lights and reflections are to be carefully avoided. March and October are the most favorable months for instantaneous photography.

### THE GREAT BRIDGE OVER THE EAST RIVER.

The company chartered by the last New York Legislature to connect New York and Brooklyn by a bridge, are rapidly making arrangements to commence this work. The plan is to erect a suspension bridge from a point on the elevated ground north of Fulton street, Brooklyn, to a point near the City Hall Park, in New York, the whole distance being about 5,860 feet, less than one-half of which is over the water, the remaining part being required to place the bridge at such a height as not to interfere with navigation. Its width is to be eighty feet, widened at each terminus to one hundred feet. It will have two roadways for carriages and carts, two railways for cars, and an elevated promenade, sixteen feet wide, for foot passengers. The cars will be drawn across in three minutes by wire ropes connected with stationary steam engines. This great undertaking, estimated to cost $6,000,000, will not be completed in less than five years.

### DYNANOMETER FOR LOCOMOTIVES.

M. E. Holtz, engineer of the Prussian State railway, has invented an apparatus for registering the tractive force of locomotives during the whole of each trip with a train. It consists of a set of compound levers, which transmit the tractive force to a spiral spring. A long sheet of paper passes over two rollers, which move at a uniform rate by means of clock work, carrying the paper in a vertical direction. The graduations on the paper in one direction represent time, and those at right angles to the first show the force employed. A pencil connected with the levers moves across the paper, varying its position with the varying force. As the paper moves at the same speed to the end of the trip, every stoppage of the train will be accurately indicated. One objection made to the arrangement is that in going over a descending grade, or in approaching a station, the dynanometer operates the same as when the locomotive is at rest; thus the number of stoppages is often confounded with the times when steam is shut off from the cylinder while the train is in motion.

### PHOSPHATES.

M. Collas, of France, has been long experimenting with phosphates, and particularly with phosphate of lime. He has shown that the latter becomes a decomposing agent of putrefaction, and after death hastens the dissolution it was the means of preventing during life; it also favors the development of new existences. In mothers, under certain conditions, there is a deficincy in the normal quantity of phosphate of lime, owing to the amount required for the development of the infant. The following preparations, recommended by him, are reported in *The London Chemical News:* 1. Solution of phosphate of soda, eight grammes in spring water, to be taken at the rate of two or three glasses per day. 2. Phosphoric lemonade, consisting of two grammes of phosphoric acid in a litre of spring water, taken from time to time as a beverage. 3. Hydrated phosphate of lime milk; fifty grammes of ordinary hydrated phosphate of lime, mixed with one hundred grammes of water, in a mortar, and afterward passed through a strainer. One, two, or three spoonsful to be taken daily, especially in soup. This is the best way of administering phosphate of lime to rickety children. The phosphate of soda has the property of converting sugar into glucose in the presence of carbonic acid.

### SPIEGELEISEN.

The important ingredient in making steel by the Bessemer process, known only by the name of spiegeleisen, a German word meaning "looking-glass iron," and suggested, probably, from the brilliant appearance of the large planes of crystalization shown on the fracture of the iron, is now exciting considerable interest at the Paris Exposition, where specimens of similar combinations of iron and manganese from various countries may also be seen. A correspondent of *The Engineering* estimates that the steel manufactures of England require at present an annual supply of about ten thousand tons of spiegeleisen, and the demand for this material is constantly increasing. The fact that the small district in the vicinity of the town of Siegen, in Prussia, has, up to the present moment, held a monopoly with regard to the English market for the supply of this article, is sufficiently important to make a careful examination of all spiegeleisen produced in different countries and localities, and now collected in the Paris Exposition, very desirable; principally with a view of getting acquainted with such places and works as may, at some future time, be in a position to supply the demands of the British market, if from natural or accidental causes the present sources of spiegeleisen should fail. After reviewing the localities of spathic ore in Austria, Hungary, Prussia, Russia, France and Italy, the writer alludes to the American spiegeleisen, shown by the New Jersey Zinc Company, made from franklinite, which is admitted to be very fine, and the intimation is thrown out that it is not impossible that America may very shortly be able to produce a supply of spiegeleisen exceeding the demand of British steel makers, and at a price which will make them more independent of the iron masters of the Siegen district. The amount of manganese in the spiegel of Siegen is stated to be from nine to ten per cent. About fifteen thousand tons are annually produced, which commands, at the place of manufacture, from twenty-five to thirty dollars per ton.

### SENSITIVE DRY PLATES.

A French photographic journal recommends the use of tannate of soda instead of tannic acid, in order to increase the sensitiveness of dry plates.

### TO SOLDER ALUMINIUM BRONZE.

Mr. Hulot has found that equal quantities of common solder and zinc amalgam form a mixture by which aluminium bronze may be readily united. The solder is still more effective if alloyed with twice its weight of tin.

### TUNGSTEN STEEL.

M. Le Guen, of France, has succeeded in making tungsten or wolfram steel by the Bessemer process. He simply substitutes an ore containing tungsten for the spiegeleisen iron of Prussia, which contains manganese. To three thousand two hundred kilograms of the gray iron known to make the best steel, is added four hundred kilograms of the tungsten ore. The steel thus obtained by the Bessemer process is well laminated, and capable of being tempered and forged; further, it is possible to make pieces of large dimensions.

### USE OF DISTILLED WATER.

The Pacific coast of South America, between the 18th and 28th parallels of south latitude, is a rainless region. All the seaport towns, for a distance of six hundred miles, are supplied with fresh water for drinking and cooking purposes, from sea-water, which is mostly distilled by means of imported coal. Not only cattle, but locomotives and stationary steam-engines are supplied with distilled water. The few natural springs, within from thirty to fifty miles of the ocean, contain so much saline matter as to be rendered unfit for quenching thirst.

### GIGANTIC GLASS PLATES.

The French Glass Company, owning the factories at St. Gobain and Chauny, which were first erected 1693, exhibit at the Paris Exposition some of the finest specimens of plate glass. One plate glass, unsilvered, measures 5.93 by 3.64 meters, or nearly twenty by twelve feet. One silvered mirror is a trifle larger in surface, being 5.90 by 3.68 meters. The glass for these and several other plates was melted in a single pot capable of holding a ton of the fused material. Silvering very large plates of glass is a delicate operation. The sheet tin for each square meter weighs two pounds; if less quantity is used, the mercury is dissolved before the operation is completed.

### PNEUMATIC DISPATCH.

The plan of carrying packages through a tube, by means of compressing or exhausting the air within it, first proposed and tried on a small scale by Richardson, of Boston, has been in successful operation for several years in London. *The London Engineering* describes an apparatus of much cheaper construction, consisting of leaden tubes, protected externally by split pipes of wrought iron, through which written messages are sent from place to place in little carriers of gutta percha. The suction or pressure required is developed in reservoirs by means of a small steam-engine and air-pump. Forty messages can be sent in each carrier, and twelve carriers can be dispatched every five minutes. Messrs. Leemans & Halske, of Berlin, and Mignon & Rouart, of Paris, have exhibited similar plans. The latter-named gentlemen propose to use iron pipes glazed on the inside.

## THE HUMAN VOICE.

Boucicault, the dramatist and actor, commenting on the Albert Hall of Science and Art, London, in *The Pall Mall Gazette*, says the human voice, when speaking with clear articulation, and supplied from good lungs, will fill four hundred thousand cubic feet of air (that is, set the whole in complete vibration), provided it be inclosed in a proper manner, and the voice placed and directed advantageously. The same voice, singing, can fill, with equal facility, six hundred thousand cubic feet. When singing, the vowels are principally used, because it is necessary to dwell upon a note, and we cannot prolong a consonant. In speaking, on the contrary, we depend for articulation on the consonants; but their short percussive sound does not travel. Mr. Boucicault's last statement seems erroneous; the sound of a consonant, or the *timbre* of a musical instrument, is borne on the air-waves at a uniform velocity, but these waves are constantly diminishing in density, and those disturbances of the uniformity and smoothness, so to speak, of these waves, which are made when a consonant is pronounced, would become imperceptible more rapidly than the regular vibratory action which gives us a perception of sound. In one sense, it may be said that if a sound ceases to be heard it does not travel, yet the air-waves causing it continue to move, after the sound is no longer perceived by the human ear; and each disturbance in the regularity of this vibratory force is carried on with the same velocity. Consonants are not heard so far as vowels, because in pronouncing a consonant we cannot increase the density of air-waves as we can when sounding a vowel.

## THE PRESSURE PROCESS OF BLEACHING.

By the old process, the straw used as paper stock was submitted to the action of chloride of lime in the beating or pulping engine. Of course, only a small portion of the chloride was used at one time, and the quantities of pulp bleached by it were small. Last year it was accidently discovered at Rochester, N. Y., that by exposing the fibrous material to be bleached to a weak solution of chloride of lime, or bleaching powder in a close vessel, under a pressure of from one hundred and ten to one hundred and twenty pounds per square inch, the vessel being slowly rotated on a horizontal axis, perfectly bleached to a snow-white, one ton or more of the material; and what is strange to relate, the larger the quantity the more perfect the decoloration. When straw is to be bleached, it is first cut into pieces about an inch long, and thrown into a rotating cylinder containing caustic lime and soda ash, under a pressure of steam thirty pounds per square inch. The rotation, continued for about ten hours, removes the silica which forms the coating of the straw. After the fiber has been washed to remove the alkali, it is submitted to the bleaching process and then placed in bins, where it is allowed to drain for eight or ten days; the longer it drains the softer is the paper produced from it. The spent liquor drained from the material is used over and over; enough fresh chloride of lime being added each time it is used to bring its specific gravity to about two degrees Baumé. The bleached stock has the consistency of stiff putty, when it is removed to the pulping engine and brought to the proper condition for making paper. From the pulping engine it passes to the "stuff-chest," and then is pumped out and passed over the wire-cloth of the ordinary Foudrinier machine, in the usual manner of making paper. This process of bleaching is applicable to all fibrous and textile materials. It is now used in about forty paper mills in this country, and is protected by patents in both the United States and in Europe.

### CREOSOTE FOR BURNS.

Dr. O. E. Brewster, and several other physicians have used creosote as an application for burns, and have found that it brought instant and complete relief from pain.

### TUNGSTEN.

Mr. E. Zettnor, of Germany, has deduced the atomic weight of tungsten or wolfram, from the composition of ferrous and argentic tungstates. The mean of the two determinations is 91.976, and ninety-two may be taken as the weight of its combining proportion.

### REMEDY FOR HEART DISEASE.

Dr. Pecholier, avers that a milk diet, if strictly adhered to, will relieve a person afflicted with certain forms of heart disease. Under the influence of this diet the impulse of the heart diminishes, together with the palpitation and the congested condition of the face, the brain, and the lungs. The patient experiences unexpected improvement, and by the adoption of this plan life may be prolonged, even in cases where a permanent cure cannot be hoped for.

### TO MAKE LIGHT FABRICS UNINFLAMMABLE.

A cheaper method than using tungstate of soda with starch, is to mix equal weights of sulphate of zinc (white vitrol), sulphate of magnesia (epsom salts) and chloride of ammonium (sal ammoniac), all pulverized with three times the weight of ammonia alum. The pasty mass thus formed is carefully dried and powdered. One part of this mixture with two parts of starch applied to muslins and other light fabrics, will effectually prevent inflammability.

### TO REMOVE WHITE SPOTS FROM THE CORNEA.

The white spots which sometimes appear on the horny covering of the eye, often increase in size so as to interfere with the sight. Dr. De Luca, reports to the French Academy of Sciences, that the sulphate of soda, which has the property of maintaining the fibrin of the blood in a fluid state, may be used with success in removing these spots. The best method of using it is to reduce the salt to a fine powder and drop a pinch of it into the eye of the patient while in a horizontal posture—the salt is soon dissolved in the liquids of the eye. After its use for a few days, patients formerly blind were enabled to see vaguely, and in the course of time their sight had been completely restored.

### FORECASTS OF WEATHER.

There are strong grounds for believing that the barometer may yet be made available in given premonitions of storms. G. W. Hough, director of the Dudley Observatory at Albany, stated at the last meeting of the American Association for the Advancement of Science, that the observations made during the past year with his self-recording barometer confirmed the opinion advanced by him at a previous meeting, that the barometric column is restless during a storm which may not be within several hundred miles of the instrument. The number of minute oscillations of the column, taken in connection with the movement apparent to the eye, will indicate the comparative severity of the storm. It is probable that one hundred similar instruments properly distributed across our continent, would record the atmospheric changes with such minuteness that new and important generalizations might be arrived at.

### A NEW CEMENT.

In a communication to the French Academy of Sciences, M. Sorel, states that basis hydrated oxychloride of magnesium, is a very valuable cement. It is the whitest and hardest of all known cements, and may be molded like plaster of paris, after which it becomes as solid as marble. It may be obtained by slacking magnesia with a solution of the chloride of magnesium; the denser the solution the harder will be the cement on drying. It has great agglutinative power. One part of this magnesium compound mixed with twenty parts of sand, will form a hard and solid block, whereas, lime will not admit of being incorporated with more than two or three parts of sand to form a block of equal hardness. It will also be found to be the best material to use in connection with pebbles in forming the walls of buildings. This cement might be made on a large scale and very cheaply, at Syracuse, N. Y., and other localities where the bittern from salt works is abundant, and limestone can be readily converted into quicklime.

### ASTEROIDS.

The recent discovery by Prof. Watson, of the University of Michigan, of another small planet, lying between the orbits of Mars and Jupiter, makes the total number of asteroids now known ninety-three. There is reason to believe that many hundreds of this interesting family of planets yet remain undiscovered. The labor of observing so many of these bodies with the accuracy necessary to compute their orbits, has become so great that unless very energetic steps are taken by astronomers, many of the smaller ones will escape their notice and again be lost. At the present time two or three are missing, and owing to the fact that their orbits had not been correctly determined, they will probably need to be rediscovered when wanted. The method of designating planets by names belonging to the ancient mythology, will have to be given up should the discovery of new asteroids continue at the present rate. Already these small planets have been numbered, and are better known to astronomers by their numerical designation than by their classic appellations.

### THE BEAVER AS AN ENGINEER..

At the last meeting of the American Association for the Advancement of Science, L. H. Morgan, Esq., of Rochester, read an interesting paper on the habits of the beaver. Having made this animal the subject of study for several years, he was able to give many interesting facts regarding the extent of their operations. On the southern shore of Lake Superior, in Marquette county, he found the remains of long canals and dams constructed by them for the purpose of transporting their cuttings, consisting of trunks of trees two or three feet long, from the place where the trees had fallen to their lodges. Some of these canals were three hundred, four hundred, and even five hundred feet long. They were generally three feet wide, with an average depth of three feet. In order to maintain a continuous depth of water, they made dams at certain distances, and followed the Chinese plan—to whom the lock was unknown—of drawing their cargo from one level to another. Mr. Morgan has settled a long disputed point. From a comparison of more than one hundred skulls of American beavers with four or five of European origin, he is enabled to state that both classes belong to the same species.

### ORNAMENTAL IRON CASTINGS.

The Paris Exposition contains samples of small ornamental work of iron, known as "Berlin castings," made at the iron works of Count Stolberg, at Ilsenburg and Harz, in Brunswick, which have all the delicacy and beauty of outline of the best brass and bronze castings. The models of iron doors, tables, church decorations, &c., are classic specimens of modern and mediæval art, having the sharp, minute impressions, and the fine finish of those produced by the electrotype process. It has been generally believed that this kind of work was made by mixing with the iron some metalloid, which has the effect of giving to the metal more fluidity and density, but this is not the fact. The specimens are made of iron alone, and are the result of the laborious researches and experiments of M. Schott, the manager of these works. His attention was first directed to the importance of procuring the finest quality of molding sand, and to prevent, as far as possible, the accumulations of air in the mold, which is drawn in during the process of pouring the liquid metal. His sand is made by mixing burnt clay with a pulverized sandstone, having a maximum porosity. It has also the fineness of grain, which is essential in producing a delicate mold. An occurrence is related which illustrates the importance of this branch of the art. M. Schott, in explaining the subject to some friends who were dining with him, sent a folded napkin from the table to the foundery, and shortly after showed them a casting which correctly represented the indentations produced by the finely woven thread of the fabric.

The most important part of the process, however, is the preparation of the metal. M. Schott made a series of experiments to determine the melting point of different kinds of pig iron; and by mixing several in proper proportions, he has been enabled to vary the melting point at will. It will surprise even practical iron founders to learn his experiments proved that the melting point of different samples of charcoal iron, made at his own blast furnaces, varied more than eight hundred degrees F. Charcoal iron generally melts at seven hundred degrees higher temperature than coke iron. The contraction on cooling is greatest in charcoal iron, and in most cases, it has the greatest density when solid. In examining various specimens of casting, M. Schott brought to his aid the microscope, and was thus enabled to detect certain differences which chemical analysis had failed to explain.

M. Schott avers that all crystals of iron are of double pyramid form, having a variable axis compared with the size of the base. The finer kinds of crystaline iron have pyramids of only half the height of those of the coarsest variety. The best quality of iron has the smallest crystals and pyramids of the broadest base in proportion to their height. The pyramids of steel are found to vary in the same way, according to the nature and quality of the material. The uniformity and parallelism of the crystals are important elements in the structure of steel. A field of investigation has now been opened by M. Schott, which should induce others to make extensive operations in this direction. The iron ore used by him is not different from that found in many other places. It is reduced in a series of small charcoal furnaces in the vicinity of the mines, which are situated in Northern Germany, near the town of Brunswick. The secret of M. Schott's success in making small and fine castings, lies in the fact that the whole process is the result of a long series of scientific observations.

Mr. Dudley Blanchard remarked that he had seen some very fine iron castings made by exhausting in the molds at the time of pouring the metal.

### NEW USE FOR PETROLEUM.

The light products of petroleum are found to be preferable to turpentine for cleansing type and wood engravings.

### ELECTROTYPE IMPROVEMENT.

M. Bouillet, of France, has found that adding a very minute quantity of gelatine to the bath of sulphate of copper effectually prevents the brittleness which has hitherto been an objectionable quality in copper deposited by electrolysis. The manner in which gelatine thus increases the tenacity of copper, has not been explained.

### OZONE.

T. L. Soret having found by the usual methods that ozone was fifty per cent more dense than oxygen, afterward confirmed his results by the method of diffusion. The velocity with which chlorine and ozone pass through the diaphragm of the diffusion apparatus, is in inversed proportion to the square roots of their respective densities, assuming that density of ozone is twenty-four.

### NEW EVAPORATING PROCESS.

E. Parion, of France, claims by his method to bring the liquid to be evaporated rapidly in connection with the heating surfaces. When evaporation takes place at the ordinary temperatures, he exposes to the sun and wind the liquid in the finely divided state of shower and spray. He prefers to use the waste heat of factories, but this plan cannot be applied to chimneys without checking the necessary draft.

### PHOTOPERIPATETIGRAPH.

This long name, which would have puzzled the peripatetic philosophers, is applied by Mr. Goebel, of Missouri, to his contrivance to be used in out-door photography. It is a dark closet on two wheels, which contains all the apparatus required by the photographer who wishes to make a picture of a parade, or the scene of a boiler explosion or railway catastrophe. A full description of it may be found in *The Philadelphia Photographer* for September.

### VOLCANIC ERUPTIONS IN THE ATLANTIC OCEAN.

The attention of the French Academy of Sciences has been called to the continued shocks of earthquakes and volcanic eruptions which have occurred for some time past on the coast of Portugal, near Lisbon. The most violent action has been between two small islands, Tesira and Graciosa. On the first of June last, a submarine volcano forced igneous matter above the surface of the ocean, and a tongue of land thus formed is now connected with the continent.

### A NEW ANÆSTHETIC.

The quadrichloride of carbon (*garod*), a compound consisting of one atom of carbon and four atoms of chlorine, and having the agreeable odor of quinces, has been used lately in Europe. It produces insensibility in less than one minute, which may be maintained without the loss of consciousness. Its use is not followed by vomiting, and has been found of service in curing obstinate headache. It should, however, be used with great caution. Nitrous oxide (*genat*) is much less objectionable as an anæsthetic.

### OZONOMETRY.

A. Cossa, in endeavoring to discover an exact method for measuring the quantity of ozone in common air, has established the following facts:

1. A solution of pure hydrate of potassium, containing no traces of organic matter, absorbs nitro-oxygen compounds without destroying ozone.

2. The quantity of iodine liberated in a solution of pure iodide of potassium, is in exact proportion to the amount of ozone passed through the liquid, which may be accurately determined by means of Bunsen's volumetric method.

### NEW ACTOMITER.

Dr. H. Vogel, of Berlin, describes, in *The Philadelphia Photographer*, his actomiter, which he affirms will reduce the main difficulty of carbon printing to child's play. The negative is placed in the light simultaneously with the instrument, which is graduated like a thermometer, and left there until the instrument indicates a certain degree; this degree of printing has to be previously established by experiment. A strip of carbon paper is placed under the negative and exposed, and gradually, as the instrument indicates four, six or eight degrees, covered up. The strip is afterward developed, and it is easy to see which degree of the actomiter corresponds with the best development. When the necessary degree of several negatives has once been ascertained, it becomes an easy matter to judge, by comparison, the requisite time for a new negative.

### NEW USE FOR ALLSOP'S ALE.

*The British Journal of Photography* says, those who are endeavoring to make improvements in what is technically known as the "dry process," are now turning their attention to the use of malt. Cotman has made good pictures by immersing his sensitized plates for two minutes in water, afterward flooding it with Allsop's table beer, then draining and drying spontaneously. To develop the picture, wash the plate and then cover it with a pyrogalic solution—six grains to the ounce of water—pour off, add two drops of a thirty-grain solution of silver with ten grains of citric acid to the ounce. When thoroughly out, wash and intensify carefully with more silver.

Mr. Carey Lea states that an ingenious combination of the malt and albumen processes has been made by putting the white of an egg into a tumbler of ale (previously beating it up and letting it subside), then filtering and using it as a preservative. This method is affirmed to give exceedingly soft pictures, and with adequate exposure, certain absence of harshness of contrast.

### THE RODMAN GUN.

*The Engineering* of July 5th, states that the gun sent to England for trial has stood the preliminary test with results eminently satisfactory and to its credit.

### SOLAR PHENOMENA.

Mr. Hofrath Schwabe, not long since, called the attention of the astronomers at Kew Observatory, to certain phenomena on the surface of the sun, which he had noticed since last December, and which he recollected to have occurred before, but only at the time of a minimum in the number of spots. These phenomena are an absence of faculæ or faculous matter, as well as of the scars, pores, and similar appearances usually visible; also, an equal brightness of the whole surface of the sun, the limb being as luminous as the center.

### A NEW EUDIOMETER.

Prof. Cooke, of Harvard College, has constructed a cheap eudiometer, to be used in the lecture-room, as well as laboratory, in which the article called "stopper cord," manufactured by the Boston Belting Company, has been found very serviceable. The stopper cord consists of conical rolls of very elastic rubber, about four feet in length, and varying in diameter from one-half an inch at one end to an inch and a half at the other. Stoppers of any diameter between these limits may be cut from the roll and bored with a common brass-cock borer, which must be moistened with water to prevent adhesion to the rubber. The stoppers are found to be air-tight under a pressure of fifteen pounds to the inch, provided the contact between the tube and stopper is at least half an inch in length.

### MAGNETIC PHANTOMS.

S. Meunier describes, in the Paris *Cosmos*, a plan for preserving a representation of the curious figures produced when iron filings are scattered upon a sheet of paper placed over a magnet. He saturates the paper to be used, with a warm solution of ferro-cyanide of potassium, and then dries it. For iron filings he substitutes pulverized magnetite or loadstone, which is placed upon the paper and submitted to the action of a magnet. After a beautiful combination of curves, called the magnetic phantom, have been made, pure hydrochloric acid gas is brought in contact with the paper and figures, and, after a few seconds, removed. The paper, being then freed from the loadstone powder, is washed very thoroughly; when dry, a dark blue figure will show, with great delicacy of detail, the positions assumed by the pulverized ore under the influence of the magnet. The method is said to be more convenient and exact than the plan of covering the paper with a mixture of gelatine and starch, or paraffine and wax.

### STABILITY OF GUN-COTTON.

F. A. Abel, F. R. S., has published the results of his experiments with Von Lenk's gun-cotton, extending over a period of three and a half years, which differ materially from those obtained by Pelouze and Maury, who came to the conclusion that, after exposure to light and heat, this kind of gun-cotton was liable to spontaneous decomposition and explosion. Mr. Abel, however, admits that the ordinary gun-cotton contains small proportions of nitrogenized impurities, having instable properties, which are formed by the action of nitric acid upon foreign matters contained in the cotton fiber. These impurities give rise to free acid, which may be effectually neutralized and rendered nascent by introducing into the gun-cotton, when first made, one per cent of carbonate of soda. To gun-cotton which has not been long exposed to the action of sunlight, water acts as a perfect protector. If it contains sufficient to feel damp to the touch. it is perfectly non-explosive, and while in this condition it may be stored in large quantities or transported to very distant places. The best practice would be to dissolve the required proportion of carbonate of soda in water, and keep the cotton constantly damp with this solution.

### SUN SPOTS AND METEORIC SHOWERS.

Mr. Hofratn Schwabe has noticed a connection between these two classes of phenomena. He finds that the minimum of spot-frequency coincides remarkably with the recurrence of meteoric showers, the period of rotation of which, viz: 33.2 years, agrees with a larger period of the sun spots. In 1833, there was an extreme scarcity of spots (only thirty-three very small groups being observed), and in 1866–7, after thirty-three years, the phenomena repeats itself. From the 1st of January to June 8, he had observed only six small groups; and out of one hundred and thirty-three days of observation, there were one hundred without spots. In the year 1848, which is the middle of the 33.2 years' period, there was a maximum of spots. If the thirty-three years' period should be established by future observations, then a maximum of meteoric showers would always occur after three years of the usual sun-spot periods. Whether this periodicity existed before, Mr. Schwabe cannot decide; but he says there appears to have been a minimum of sun spots in 1798.5, and a maximum in 1816.8. The astronomers alluded to are now engaged in determining a curve of spot-frequency during the last forty years, founded, not on the number of the observed groups, but on the area of spotted surfaces, as observed by Hofrath Schwabe, by which the periodicity will be represented with greater precision than before.

The reading of this large number of scientific items, with the remarks they elicited from Drs. Rich, Richards, Bradley, Parmelee, and others, occupied the whole evening, and at a late hour the Association adjourned to next Thursday.

## September 26, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Esq., Secretary.

The Chairman opened the proceedings by reading the following notes on scientific progress:

### HERMETIC SEAL.

A mixture of gelatine and glycerine, is liquid while hot, but on cooling it becomes solid, retaining considerable elasticity and toughness. The neck of a bottle dipped into this melted compound is covered with an air-tight cap, which can be made as thick as desired by repeating the operation.

### CEROLINE.

Professor Tozzetti, of Florence, has presented a note to the French Academy of Sciences on the wax produced by the fig, cochineal (*coccus coricœ*), which contains about half its weight of ceroline. He states that it may be procured in such large quantities, as warrant its use in the industrial arts.

### IMPROVEMENT IN THE BLAST FURNACE.

A French journal states that M. Morgan has increased the production of iron in furnaces six-fold, by giving them greater dimensions; for instance, nine and a half meters diameter (nearly thirty feet), and blowing into them by twelve tuyers. A hollow cone is also constructed in the middle of the furnace, through which another blast is introduced.

### VELOCIPEDES.

This carriage, which is simply a saddle sustained before and behind by a large light wheel, and at such a height that the rider may use his own feet as propellers, has again been brought into use in Paris. Many amateurs who are fond of this sort of violent exercise, have selected the vicinity of the cascade in the Bois de Boulogne, where they may be seen usually between the hours of nine and eleven, showing their skill and testing their comparative speed.

### CROMLECH.

M. de Closmadeuc has discovered, in a small desert island in the Bay of Morbidan, France, a very fine cromlech containing more than sixty obelisks of granite, forming a regular circular of one hundred and eighty meters in circumference. A curious fact is, that only one-half this cromlech, which is supposed to have been a Druidical altar, is now on dry land, owing to the encroachment of the sea. M. de Closmadeuc, has made large excavations in the neighborhood, and discovered an enormous quantity of pottery, similar to that found in Celtic monuments; several hundred flints worked by man, as well as a large number of stone hatchets.

### SAFETY LAMPS.

Mr. Hutchinson, manager of the Barnsley Gas Works, and Mr. Wilson, steward of the Darfield Main Colliery, have recently tested the relative value of different kinds of safety lamps when exposed to a current of air and explosive gas. Their apparatus consisted of a rectangular box about twelve feet long, and eleven inches by four inches inside, attached to the flue of the retort-house chimney, the draft being three-tenths of an inch as indicated by a water-gauge, and the velocity of the current of air being at the rate of five miles an hour. The several lamps to be tested were in succession placed at one end of the box, and at the other was a glass sight-hole for the purpose of watching the operation. A stream of gas and air was let into the box so as to entirely surround the lamp. Every lamp tried produced an explosion of the gas. The Davy lamp, with a shield on the outside of the wire gauze, exploded in six seconds, with the shield on the inside in nine seconds; the Belgium lamp in ten seconds; the Mizard lamp in ten seconds; the small Clany lamp in seven seconds; the large Clany lamp in ten seconds, and the Stephenson lamp in seventy-five seconds. The latter proved to be far superior, but all were shown to be unsafe in a strong current of marsh gas or fire-damp, and should therefore, be regarded merely as indicators of danger when used in mining.

## WHAT MAKES IRON FIBROUS?

*The London Engineering* says when Mr. Bessemer manufactured wrought iron from cast, by blowing air into the molten metal, it was objected to the product that it had no fiber, as common puddled iron had, and that iron without fiber must be necessarily weak. In this inference—which was wholly theoretical—we did not concur, and the question then arose: What does fibrous iron really mean? When the particles of wrought iron are brought to a high temperature without the presence of an intervening material, they cohere in every direction, and the iron is not fibrous. But when slag is intermingled, as in common puddled iron is the case, there are intervening layers of cinder, which, when the iron is passed through rolls, are not wholly expelled, but are only greatly attenuated, and as these planes are then very numerous, and pass in every longitudinal direction, they prevent, to some extent, the latent adhesion of the particles, which, however, adhere end to end, and a fibrous iron is thus produced. It is now well known that homogeneous iron is much stronger than fibrous iron. But at the beginning of the manufacture, fiber was accounted as necessary in iron as in ropes or thread—a theory resulting merely from the accident of the production of fiber by the modes of manufacture then exclusively employed. In the case of iron produced by the common process, any bubble or vacuity in the metal becomes filled with slag, which hinders the sides from being effectually welded under the hammer. But in the Bessemer iron, as the slag is absent, the sides of the bubble cohere, when the ingot is subjected to pressure while still hot. It is better to hammer the ingots while still hot, after having been poured, than to allow them to cool and to heat them afterward. For in the one case the heart of the ingot is the hottest part, and in the other the coldest.

Mr. J. K. Fisher said that bringing iron into the fibrous state does not add to its strength. He regarded this common assertion as a fallacy.

### HOW PAPER IS MADE IN CHINA.

Most of the paper used in China is made from the bark of various trees and plants, and from the bamboo. The manufacture of bamboo paper is carried on extensively in the southern part of the country. In selecting stock from the bamboo plantations on the mountains, preference is given to the stems which are about to put out branches and leaves. Early in the month of June the canes are cut into pieces, from five to seven feet long, and placed in a pit, which is supplied with water. After soaking for several weeks the canes are beaten with a mallet, in order to remove the thick bark and green skin. The remaining filaments, resembling a fine sort of hemp, are treated with lime and water, raised to a certain temperature. After remaining in this bath for about a week, the filaments are removed, washed with cold water, passed through a lye made of wood ashes, and then placed in a boiler. This process is repeated until the material begins to grow putrid, when it is transferred to a mortar and pounded into pulp by means of water power, after which the mass is treated with bleaching powder. The pulp thus prepared is made by hand into sheets of various thickness, by means of a web of silk tissue within a light frame, on to which the workman places the required quantity of pulp. When the water has run off from the corners of the frame, he turns the sheet over on to a large table, when it is pressed. Each sheet is afterward raised and dried separately in a kiln built for that purpose. Writing paper is made from the finest part of the bamboo material. Another kind is made by mixing rice straw with the bamboo fiber. A very strong paper used for window blinds and other articles, which in this country are generally constructed of woven substances, is made by mixing sixty per cent of the bark obtained from a tree called "*tchou*" with forty per cent of bamboo material. Another variety of strong paper is obtained from the bark of the mulberry tree, and is used in the breeding and culture of silkworms. The same material, made from a thinner pulp, is employed in the manufacture of umbrellas, fans and fire-screens. Bark paper, which is to be painted, is first passed through a solution of alum water to destroy the fine filaments, which are commonly found on the upper side of the sheet, as it lies in the silk tissue frame—the lower side in contact with the tissue being much more smooth. For many uses, when only one color is required, the coloring material is added to the pulp.

## THE DAVIS SUPERHEATING STEAM BOILER.

Mr. Wright illustrated on the blackboard the arrangement of the Davis boiler, which is simply an upright tubular boiler, having above the tubes a series of hollow globes, which are connected by pipes, and through which the steam must pass on its way to the cylinder. Within this circular series of hollow globes, is the steam drum. It is claimed that the effect of the passage of the hot products of combustion around these globes superheats the steam, and that steam is not cooled on its passage to the cylinder to as low a degree as that in the main parts of the boiler. The novelty in this boiler is not of great importance. It is doubtless an efficient boiler, but the discussion which followed on its merits seemed to indicate that it is not more safe than the ordinary tubular boiler.

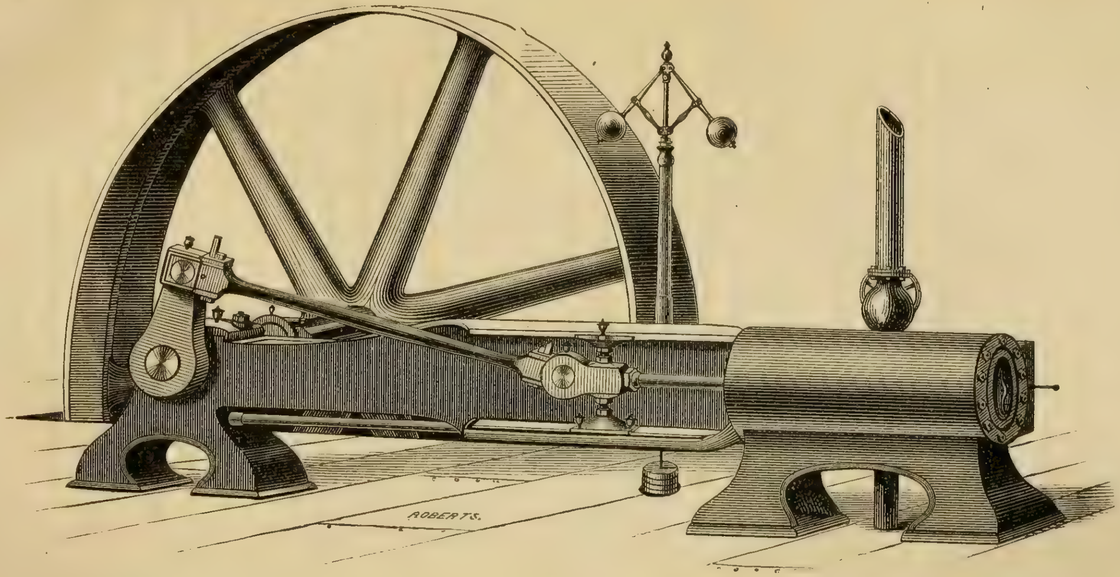
## THE BABCOCK AND WILCOX STEAM ENGINE.

R. N. Thurston, of the U. S. Navy, explained, by means of diagrams on the blackboard, the construction of this engine, which is fully set forth in the following paper:

The inventors of this engine make no pretension to the introduction of radical improvements in the principle of using steam expansively, but they have devised and perfected a new and simple method of operating and controlling the action of the valves for admitting and cutting off the steam, by means of which better results are obtained than by the devices heretofore in use.

The adaptation of a cut-off mechanism to act in conjunction with a plain slide valve, the latter to admit and exhaust the steam, and the former to close the port at any desired point in the stroke, has been a favorite pursuit of engineers for the past half century; but in all arrangements previous to the invention of Babcock & Wilcox, the motion of the main valve had more or less effect upon the action of the cut-off, and the latter would not work with the desired rapidity at all points, nor would it admit of a range of motion throughout the stroke of the piston. Nine-tenths of all the expansion engines now built in Europe have some modification of this form of valve gear, and the engine of Messrs. Farcot & Sons, which received the grand prize at the late Paris Exposition, was of this class.

One of the points in which the Babcock & Wilcox engine differs



BABCOCK & WILCOX'S HORIZONTAL STATIONARY ENGINE.

from the best engines which have preceded it, is the manner in which the cut-off valves are operated, viz: by the action of the steam itself, independent entirely of the action of the main valve; thus insuring an instantaneous, positive, and easily controlled cut-off, at any desired point in the stroke of the piston. The distribution of the steam to the alternate sides of the piston, and its release from the cylinder when the stroke is completed, are performed in the manner most approved by experienced engineers, by means of a plane slide valve operated by the ordinary eccentric. But from the fact that the induction valve has in no case to effect the suppression of the stream—or act as a cut-off valve—and from the further fact that the cut-off is actuated independently of the motion of the main valve, the functions of "lead" and "cushion" can be adjusted to any desired degree, without in any manner affecting the action of the cut-off valve. This is an important distinction between the operation of the main valve of this engine and those which have preceded it. In the ordinary three-ported slide valve, or in any other arrangement where the several functions of *lead*, *cut-off*, *release*, and *compression*, or closing the exhaust, are dependent on the motion of one eccentric, the "exhaust" functions—*i. e.*, the release and compression—must always be subservient to the "steam" functions—*i. e.*, the lead and suppression, or cut-off.

In the Babcock & Wilson engine, however, the cut-off, being actuated by a separate and entirely independent mechanism, a single valve is capable of giving any degree of lead and compression which may be desired, as perfectly as with the most complicated valve gear.

Another important difference between this engine and all previous adjustable slide or rolling valve cut-offs, lies in the fact that the valves have a constant travel under all circumstances, thereby insuring an equal wear. A valve which varies its throw to effect the cut-off, as in all detachable valve gear, cannot wear equally, and has a continual tendency to grow leaky. Again, this constant throw insures a wide open port, and the least loss through throttling the steam by the action of the valve—or, in other words, enables us to obtain a pressure in the cylinder more nearly approaching that in the boiler than can be realized with other valve motions.

Another peculiarity of this engine is its extreme simplicity and fewness of parts exposed to wear. At first sight, it has the appearance of one of the simplest styles of non-expansive engines, having none of the catches, cams, dash-pots, springs, tappets, etc., which are common to other expansion engines. With the exception of the cut-off gear, the engine is a simple slide-valve engine, and can be used as such, should any accident occur to the cut-off. The cut-off itself is also of the simplest possible description, having the least possible number of parts, consistent with a proper performance of its functions. It consists of two cut-off slides, a miniature steam cylinder, and a valve for controlling the admission of steam to the same. This small cylinder, being enveloped in the steam, requiring no packing, and having only the weight of the piston to produce wear, is, for all practical purposes, indestructible. The cut-off slides are always balanced when they move, consequently they are not exposed to injurious wear.

Another advantage of the Babcock & Wilcox engine is that it is easily comprehended by ordinary mechanics. The motions and adjustments are similar to those familiar to any one who understands a plain slide-valve engine; and any man who can adjust such an engine properly, can readily adjust this.

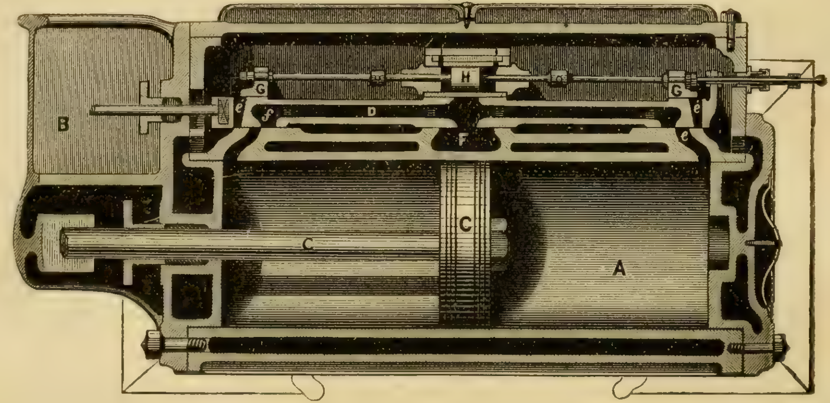
The cut-off valve of this engine presents a convenient means of stopping at any desired point, simply by opening or closing the cut-off valve by hand, as the case may require. The engine may be warmed up, also, without danger of starting, by closing the cut-off valve by hand. In cases where it is desirable to back the engine, a starting bar may be readily shipped, and the engine handled with the same ease as the plain slide.

The regulator or governor is driven by gearing, thus avoiding all danger of breakage or slipping of belts, and the consequent damage to the engine and machinery from the "running away" of the engine.

In addition to the steam jacket for preserving the temperature of the cylinder, a covering of felt is employed around all the exposed parts, and this in turn is covered by a casting of polished metal. The latter is the best possible protection against loss by radiation.

Fig. 1 represents a horizontal section of the cylinder and valves, showing the peculiarities of the cut-off motion. A is the cylinder, which is steam-jacketed, as are also the heads. B is a portion of the bed piece, which forms also the front head of the cylinder. C is the piston and C' the piston rod. D is the main valve, and c c' the induction ports, and F is the exhaust port. The body of the valve is hollow, and conveys the exhaust steam from either end of the cylinder alternately to the exhaust port F, whence it goes into

Fig.1.



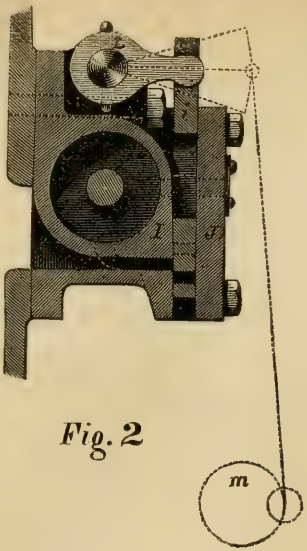
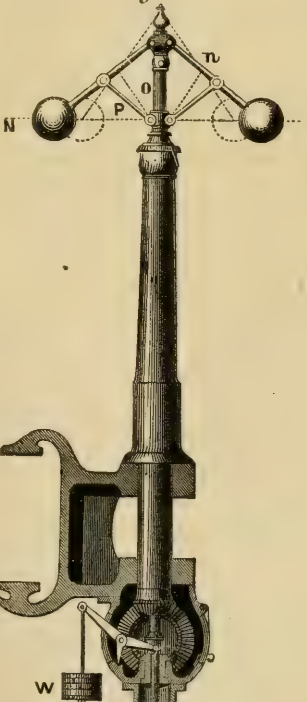


Fig. 2

Fig. 3.



the exhaust pipe. The steam passes through ports e' in each end of the valve into the induction ports of the cylinder, alternately as they are opened by the motion of the valve, derived from an eccentric in the usual manner. On the back of the valve, at either end, is a slide, G, which can be made to cover the port at that end, and these slides are each attached to one end of a piston, H, fitting in a small steam cylinder, bolted to the back of the valve, and so adjusted that when the port in one end of the valve is closed the other is open. Upon steam being admitted to either end of the piston, H, the piston is shot over, and the corresponding slide closed, to cut off steam from that end of the main cylinder, while the port at the other end of the main valve is opened, ready to admit steam to the other side of the main piston when the valve shall arrive at the proper position.

It will be observed that the cut-off slides, G, are always balanced when moved. The one about to close having steam of equal pressure upon each side, while the other one has been balanced by the main valve riding past the end of the valve face on the cylinder, thus admitting steam behind the slide, G. This condition obtains during the whole stroke of the piston until the steam is cut off, after which the cut-off slides, G, remain stationary relatively to the main valve, until ready to cut off steam on the return stroke, previously to which time they have been balanced by the overriding of the valve at the other end. These slides have, therefore, literally no wear, and once fitted tight, they will remain so indefinitely. The piston, H, in the small cylinder, is turned to fit, and has no packing, neither have the rods stuffing boxes, as the pressure is equal on both sides, except during the inappreciable time which intervenes between the exhausting of the cylinder, I, and the movement of the piston. The only tendency to wear in these parts is due to the weight of the piston and rods, which is supported on large surfaces. In fact, after twenty months constant use, none of these parts have worn sufficiently to obliterate the tool marks upon the surfaces.

Steam is admitted alternately to each end of the piston, H, at every revolution of the engine, causing the cut-off slides to move at every stroke, cutting off the steam at the point determined by the governor.

Fig. 2 shows a cross section of the cylinder, I, and its valve. This valve is balanced by the plate, J, upon its back, and is operated by a toe upon the rock shaft, L, carried upon the main valve, and extending through the end of the steam chest, where it receives motion from a crank, m, which is adjusted in its position by the governor. The exhaust ports of the cylinder, I, are made upon the bottom, and are at a little distance from the end, while the steam ports are upon the side and at the extreme end of the cylinder. By this arrangement the piston closes its own exhaust port and cushions on the remaining distance, thus dispensing with all dash-pots or air cushions, and causing the valve to work without any noise.

The valve, i, being balanced, and the rod, L, carried through its stuffing box by the main valve, there is the least possible power required by the regulator to adjust the crank, m, thereby insuring a more sensitive action than can be attained where the governor has labor to perform.

The governor is peculiar, and is shown at Fig. 3. The balls, N, are hung upon arms in the usual manner, which arms are jointed at their upper ends to a head attached to the rod, o, which slides within the hollow shaft that drives the balls; the motion being communicated through the radius rods, p, which are jointed at their lower ends to the shaft, and at their upper ends to the center of the arms, n. The rods, p, are half the length of the arms, n, measuring from the center of the ball, and it will be readily seen that in consequence of this arrangement the arms, n, and rods, p, form a parallel motion, and compel the balls to move outward in a horizontal plane.

In the ordinary pendulum governor, the balls move in the arc of a circle, and rise as they extend; it therefore requires an increased speed to maintain them in their advanced position, and the engine must consequently run faster when the load is light than when it is heavy. In this improved governor it will be seen that the gravity of the balls has no tendency to move them in either direction, as they are compelled by their attachments to move in a horizontal plane. The centrifugal force causes them to diverge, and a weight, W, tends to bring them towards the shaft. When, therefore, these two forces are in equilibrium, the balls will remain in the same position, but as either preponderates, they are moved in a corresponding manner, thus affecting the speed of .
.ngine by varying the amount of cut-off. The weight, W, is supported upon a bent lever, which is so proportioned that the centrifugal force of the balls, at any given speed, will just balance the weight, W, in all positions. The speed of the engine will,

therefore, remain at that fixed amount under all variations of load or pressure of steam; for any increase or diminution of speed will cause either the balls or weight to preponderate, and the point of cut-off to be changed until the speed is again brought to the standard where the two forces are in equilibrium.

Any desired speed can be obtained by altering the weight, W, and the action of the governor will be as perfect in one case as in any other. A spiral on the rod, o, serves to advance or retire the crank, m, relatively to the main crank, so as to cause the cut-off to occur earlier or later in the stroke, as the balls diverge or converge; and the amount of this adjustment is such that the cut-off may be varied from nothing to seven-eighths strokes.

The following indicator diagrams were taken from engines of this construction, and elucidate its action and economy.

The importance of the indicator as a means of studying the action of any given engine, and of comparing the relative values of different constructions and proportions, though known from the time of Watt, has but recently been fully appreciated by engineers; and, in fact, not until within a very few years has there been an instrument manufactured capable of being used with any satisfactory degree of accuracy upon the quick moving engines now employed for most stationary purposes. To its employment the world is indebted for its most satisfactory practical knowledge of the action of steam, and the best means of obtaining the highest economical results.

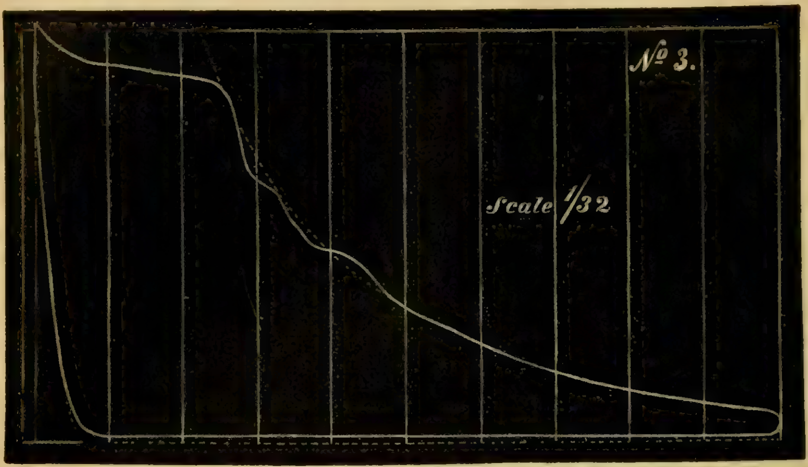
But in order to compare one engine with another, they should be in precisely similar circumstances. As, however, this rarely occurs, it is necessary to have some standard by which all engines may be compared, and their relative performances determined. The best means for doing this, at present within our reach, is to compare each engine with a theoretically perfect engine of the same size, under the same circumstances; and the engine which more nearly approaches the theoretical is evidently the best

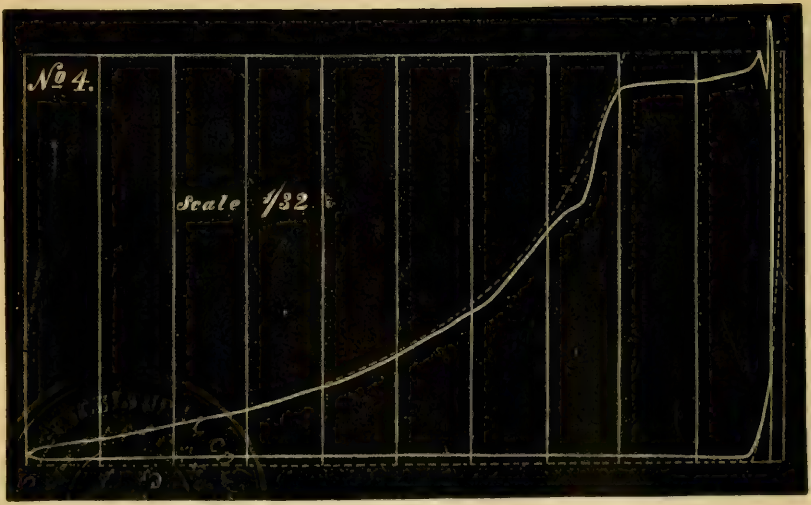
The expansion of steam follows certain laws, and the quantity of steam being known, as well as the space which it occupies, it is possible to tell the correct pressure for each variation in the space occupied. A curve can thus be calculated which will give a diagram of the theoretical action of a given amount of steam in a given size of cylinder, and the diagrams taken from any engine may thus be compared with a theoretical diagram for the same quantity of steam used in the same sized cylinder, the ratio existing between the actual and the theoretical diagrams serving as a measure of the perfection of the engine and valve mechanism. It is impossible to construct an engine in which there shall be no loss from friction of the steam in the pipes and passages, or from clearance; but the engine in which these losses are least is unquestionably the best.

In the annexed diagrams the highest line represents the pressure of steam in the boiler, and the lowest line that of atmospheric pressure. The scale marked upon each diagram is the fraction of an inch, which represents one pound of steam pressure in the vertical lines of the diagram. The horizontal length of the diagram represents the length of stroke of the engine, plus an amount of space at the end (exterior to the heavy outline), which is called the "clearance," and represents, in the same scale as the stroke, the amount of space included between the end of the cylinder and the piston at the extreme of motion of the latter, and also the contents of the passage ways. It will be seen that the length of stroke is represented by no particular scale, but each of the divisions is one-tenth of the full stroke. The heavy outline is the diagram formed by the indicator, and represents truly the pressure in the cylinder at each fraction of the motion of the piston. Where the line commences to fall abruptly is the "point of cut-off," and shows what portion of the stroke the steam is admitted. During the remainder of the stroke the steam expands, reducing the pressure and forming a curve called the "expansion curve." At, or just before, the end of the stroke the steam is released, and "exhaust" commences. The returning line shows, by its distance from the base line, the amount of "back pressure," the exhaust closing a little before the termination of the return stroke, thus confining the remaining steam, compressing it, and forming a "cushion" to stop the momentum of the piston, and prepare it for the return stroke. This is shown by the rounding of the corner and the rising of the pressure at the termination of the stroke.

The dotted outline represents the theoretical power of the amount of steam exhausted from the cylinder in each instance, when used in a cylinder of the same size, with no losses from friction in the passages, back-pressure, or clearance. The proportion of the area of the actual to the theoretical diagram represents the *relative* efficiency of the given engine, being in these diagrams as from 90 to $92\frac{3}{4}$ is to 100, which is believed to be better than is shown by the carels taken from any other style of engines.

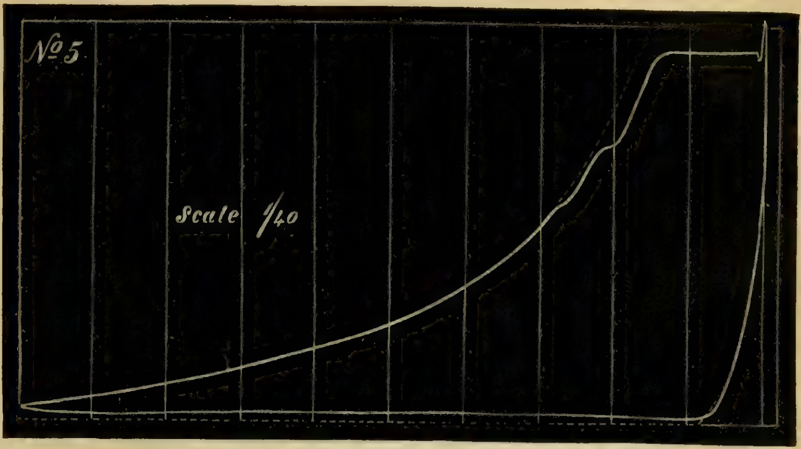
STEAM INDICATOR CARDS.





From Engine in Roger Williams' Manufacturing Co's Mill, Providence, R. I.
14 in. Cylinder, 5 ft. Stroke.

STEAM INDICATOR CARD.



From Engine in Thos. B. Wilkins' Cotton Mills, Washington Village, R. I.
14 in. Cylinder, 42 in. Stroke.

A very interesting discussion on the value of this method of cutting off steam, followed the reading of the foregoing paper; after which the meeting adjourned.

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## October 3, 1867.

Prof. S. D. Tillman in the chair; J. Wyatt Reid, Esq., Secretary.

The Chairman opened the meeting by reading the following items of scientific news:

### NEBULÆ.

Prof. W. A. Miller, in a lecture before the Royal Institution of Great Britain, on spectrum analysis, after describing the characteristics of the fixed stars revealed by the spectroscope, passed to another series of objects which have long been enveloped in mystery. Scattered over different parts of the heavens are a number of remarkable bodies, which look like patches of light or luminous clouds. In some cases they are collected into rings; in others, into spirals; while in other instances they assume still more definite forms. These nebulous masses of light have, ever since their discovery, excited in a high degree the wonder and curiosity of those who have examined them. The interest they awaken is perhaps still further increased by a remarkable speculation concerning them, put forth by Sir William Herschel, when asked if it was not possible that these nebulæ might be the primordial forms of matter, from which stars and suns and their attendant planets had been produced. Notwithstanding minute and careful observations by the telescope, nothing was known of the physical condition of the matter composing these nebulæ. It was not even known whether they were aggregations of stars, so infinitely distant from us that we could not discern the separate stars, or whether each nebulæ was a separate luminous object of a nature entirely different from the stars. Mr. Huggins, has been enabled in several instances, to show that the nebulæ are not stars, but that they are composed of glowing gas; and, further than that, he has been enabled to give some hint as to what this gas may be. When he was examining one of these nebulæ with his spectroscope, for the first time he observed what appeared to be a single vertical line of light; this, on closer inspection, was seen to be accompanied by two fainter lines in the more refrangible portion. This observation immediately gave him the key to the nature of these bodies. The first nebula that he examined, was a comparatively brilliant one in Draco (37 H, iv). The nebulæ are usually referred to by letters and numbers which represent the position of these bodies in certain catalogues drawn up by astronomers of eminence. This nebula in Draco, then, instead of giving a continuous spectrum crossed by black lines, like the stars, was found to give three lines of light only; and the greater part of the light was concentrated in one of these three lines. Indeed, had it not been for this circumstance, the light of the nebula is so excessively faint, that it would have been impossible to see it at all, as spread out in a continuous spectrum, and, in fact, Mr. Huggins scarcely expected it would be possible to get any accurate observation in consequence of the faintness of the light. The result, however, amply rewarded him for his trial. On examining the spectrum of the nebula, and comparing it with those bright lines of the solar spectrum with which it most nearly corresponds, it was found that at the least refrangible end, there was no line corresponding to the red line of hydrogen. An important observation made by Plücker, upon rarified gases in tubes, may have a bearing on this point. He found that as hydrogen becomes rarified its red line disappears. Hence, the absence of the red hydrogen line in the nebula may be connected with the attenuated condition of its gaseous materials. It must not be supposed that all the nebulæ give lines like the one under consideration. Of sixty which Mr. Huggins has examined, about twenty exhibit the bright lines due to matter in a gaseous state, all of which contain the bright lines corresponding to that of nitrogen; in some the other fainter lines are not seen. Such spectra are not, therefore, produced by a group of stars; not by a substance like any others that we have seen hitherto in the heavens; they must be furnished by masses of glowing gas, which are giving out light of these three particular degrees of refrangibility.

### COPPER FOR CHOLERA.

Dr. V. Burq, having observed in 1852, that about two hundred persons working in and around a copper foundery, were not attaked by cholera even during the worst stages of the epidemic, made further inquries and found that all persons handling this metal, whom he met, enjoyed the same immunity. He, therefore, concluded to try the use of copper as a medicine for those attacked by cholera. He administered sulphate of copper internally, and appled metallic copper externally. It was asserted by some medical authorities that French the plan was not successful, but a late communication to the Academy by Dr. Lisle of the lunatic asylum at Marseilles, contains the statement that he had cured twenty out of twenty-four patients by administering sulphate of copper, even in smaller doses than those prescribed by Dr. Burq.

### THALLIUM OXIDES AND OZONE.

Schönbein states that ordinary oxygen is without action on protoxide of thallium, while ozonized oxygen combines rapidly with this oxide, and forms the peroxide of thallium, which is brown. Paper steeped in a solution of protoxide of thallium and exposed to the free air, would be an excellent test for the presence of ozone, if the carbonic acid of the air did not transform the oxide into carbonate, which passes more slowly to the state of peroxide and blackens with difficulty, under conditions where strips of paper iodized and starched, become colored at the end of a few minutes in an atmosphere containing only one two-hundreth-thousandth part of ozone. However, it will be found advantageous to use both the oxide of thallium and the iodized paper as ozone tests.

### EXPEDITION FOR THE NORTH POLE.

Mr. Gustave Lambert, of Paris, proposes to reach the open Polar Sea and the Pole itself by a route never before tried. The enterprise has been sanctioned by fifty distinguished Frenchmen, and the Emperor has already given it his approval.

The British Association for the Advancement of Science, held its annual meeting during the first week of September, at Dundee, Scotland. The attendance was very large; about 2,500 members being present. The Duke of Buccleugh presided over the general meeting. The presiding officers of the several sections were as follows: Chemical Science, Prof. Thomas Anderson; Geology, Mr. Archibald Greikie; Mathematical and Physical Science, Prof. S. W. Thompson; Mechanical Science, Professor Rankin; Biology, Prof. Sharply; Economic Science, Mr. Grant Duff, M.P; Ethnology, Sir Samuel Baker. We have neither space nor time to notice in detail the able addresses of these officers; a single eloquent passage, however, from that of Sir Samuel Baker, the distinguished traveler, relating to America, deserves to be recorded in our volume:

"Columbus achieved the feat that has completely altered the geography of his age, by the discovery of America. How little did he dream that within the short interval of three and a half centuries the New World that he had discovered would be able to defy the Old; that upon the waves which rocked the frail canoes, iron-clads would fly the stars and stripes; that a vast nation of Christian men should spring from the new soil and people the desolate wastes; that the wilderness should become a garden, and the swamps luxuriant cotton fields; that great cities should arise upon the margin of her rivers; that the slave should be rendered free, and that the electric spark should speak in the profound depths of the Atlantic, and hold communication each minute with the West!—that weary, distant West, to which for weeks and weeks he had struggled on toward unknown shores, lost on a boundless ocean, but trusting in a Divine guide, who watched over the human instrument that steered onward on the grand path to civilization. In the short period of three hundred and eighty years, a small practical portion of the interval assigned to the existence of man upon our earth, what vast changes have occurred, not only in geographical discovery, but by its results. America has become a giant, an irresistible power upon her own soil, separated from Europe by an ocean that renders her secure from hostile aggression. With every variety of climate from the frigid to the torrid zone, with fertile soil, boundless forests, navigable rivers of prodigious extent, and commodious ports, the future of that wonderful country may be prognosticated by a comparison with the past. The first steps of a young colony are slow and full of difficulty; but if, in three hundred and eighty years, America has attained her present high position from an utterly savage state, what part will that vast continent assume in the history of the world?"

## *MOODY'S CLOTHES FRAME.*

Mr. Dudley Blanchard explained this improvment. This frame consists of a square upright, to each side of which arms are pivoted with their outer ends pivoted to smaller uprights, in such a manner that, when they are raised in a vertical direction, the branch uprights and arms are folded together close to the main upright, so that when not in use it occupies but little room.

## *THE GERNER STEAM BOILER.*

Mr. Gerner explained the construction of his boiler, the peculiarity of which consists in having the steam chamber within the boiler itself, which is connected with a small steam drum on the top, so that all the steam made must pass upward and then downward into the steam chamber. This chamber is slightly cone-shaped; the water entirely surrounds it and nearly fills the boiler; thus, a comparatively small quantity of water is exposed to great heating surface. The inner cone is connected with the outer shell of the boiler, so as to give the shell greater strength.

### *UNIVERSAL BOILER ALARM GUAGE.*

Mr. T. C. Banks, of Wallingford, Conn., exhibited a model of his steam gauge, designed for protecting flue of boiler by preventing low water, and thus also preventing explosions. When the water falls in the boiler it also falls in a tube attached to the outside of the boiler, but in connection with its water space. Consequent to this falling of the water is the entrance of steam, which expands the tube longitudinally, and draws a movable plate connected with one end of spring, which moves a valve that admits steam to the whistle, thus giving notice that the water is too low in the boiler. A similar gauge can also be used to indicate when water is too high in the boiler.

After some discussion on the merits of this alarm gauge, the Association adjourned.

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## October 10, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Esq., Secretary.

The Chairman presented the following summary of scientific news:

### BRONZE AND STEEL ORDNANCE.

The French government are now testing guns having an interior of steel and an exterior of bronze. It is supposed such cannon combine the maximum of wear with the minimum of liability to explosion.

### NITRO-GLYCERINE FOR BLASTING.

The summit tunnel on the Pacific railroad has just been completed. The work was expedited about twenty-five per cent faster than it could have been, had not nitro-glycerine been made on the spot and substituted for gunpowder.

### RED LEAD.

Barton produces red lead by heating the oxide of lead to redness with the nitrate of soda, or by heating at the same temperature a mixture of 1,894 parts of sulphate of lead, 665 parts of carbonate of soda, and 177 parts of nitrate of soda. The resulting mass is to be washed.

### TO CLARIFY TURBID WATER.

Turbid water, holding any kind of earthy substances, is rendered fit to drink in from seven to fifteen minutes, if to each litre there be added 4-100ths of a gramme of finely powdered alum, or three-quarters of a pound to every ton of water, care being taken to agitate the liquid when the alum is introduced.

### DOUBLE SESQUICHLORIDE OF IRON AND SODIUM.

F. Landauer has produced this new compound by the action of hydrochloric acid on artificial ultramarine. By writing upon paper with the solution, and afterward warming it, the letters become black, just as in the case of some sympathetic inks, but the writing does not disappear by the action of water.

### MOLTING OF FISHES.

M. Baudelot, in a paper read before the French Academy of Sciences, says tubercles are often observed on the sides of fishes, accompanied by the falling off of the scales; these were sometimes considered characteristic of a new species of fish. They are, however, periodical, and found only at certain seasons of the year, thus constituting a true molting.

### POISONING BY PHOSPHORUS.

M. Dybkowsky, in a recent memoir, states that the poisonous action of phosphorus is entirely due to the formation of phosphoreted hydrogen gas, which, in passing into the blood, rapidly combines with the oxygen present. Hence, he concludes that death from phosphorus is nearly equivalent to death by asphyxia.

### TO DETECT CHICCORY.

Dr. Draper gives, in the *Philosophical Magazine*, the means of estimating more or less accurately the amount of chiccory present in some kinds of ground coffee. He uses a tube, having its lower end drawn out so as to be of smaller diameter, which is graduated into four equal divisions. Chiccory and other roots sink in water, while coffee floats. By means of this tube the proportion of the

the adulterant in a given quantity of coffee mixture may be determined with sufficient accuracy for commercial purposes.

### ANALYSIS OF BLISTER STEEL.

David Forbes, F. R. S., has communicated to *The Chemical News*, the results of his analysis of specimens of blister steel, which will be examined with interest, because analyses of such steel are rare and seldom found in chemical works. The per cent results are as follows: Iron, 99.116; carbon, combined, 0.627; graphitic carbon, 0.102; manganese, 0.120; silicon, 0.030; sulphur, 0.005. No trace of phosphorus was found, although search was made for it by several different methods.

### WHITWORTH'S TRUE PLANES.

Mr. Whitworth, of England, proposes to place in the South Kensington Museum, to be there perpetually preserved, three original true planes and a measuring machine or instrument demonstrating the millionth part of an inch, and further to make a sufficient endowment to provide for the delivery of lectures to explain such instruments. Their importance will be manifest when it is considered that the value of every machine, when made of the best materials, depends on the truth of its surfaces and the accurate measurement of its parts.

### ANTI-INCRUSTATION SOLUTION.

To prevent the formation of strongly adhesive sediments in a steam-boiler, mix 125 kilograms of chrystalized chloride of barium dissolved in 50 of water, with 25 kilograms of hydrochloric acid having a specific gravity of 1.20; apply 15 parts by measure of this acid solution to every 1,000 parts of water to be used in the boiler.

### GAS FROM COFFEE.

M. Babinet has reported to the French Academy the following information with regard to the evolution of gas during the process of making coffee. If finely-ground roasted coffee be steeped in cold water, gas will be evolved to an extent about equal in volume to the quantity of coffee used; and this action will take place very rapidly, insomuch that if a bottle be half filled with coffee duly ground, and the remaining space then filled with water until the cork is reached, an explosion will ensue, sufficient in force to expel the cork, or even break the bottle.

## FOSSIL IVORY.

It is said that the tusks of at least one hundred mammoths, or about forty thousand pounds of ivory, are baftered for every year in New Siberia. Notwithstanding the large amount carried away, the supply does not seem to diminish. These remains are scattered along the valleys and near the mouths of great rivers; and in a number of instances the mammoth entire has been discovered, with its skin protected by a double covering of hair and wool, and its flesh in such a state of preservation as to afford food for dogs and wild beasts. Whatever the cause of the Siberian mammoth's death, it is certain they were suddenly enveloped in ice, which has not been disturbed since they were first entombed.

## THE TORTOISE.

Dr. Deschamps has, after minute investigation, arrived at the conclusion that the shell of the tortoise is a calcareous metamorphosis of the derma, the fibers of elastic tissues having the property of admitting of incrustation with calcareous salts. It is well known that any osseous surface exposed to the air mortifies, owing to the destruction of the periosteum, the membrane which supplies calcareous matter. This is precisely what happens when a scale of the tortoise shell falls off; the bone below mortifies and falls off too, and both are regenerated by the action of the skin, divided into filaments, which penetrate into all the grooves. In order that this action may be safely performed without any necrosis of the bone, the scale does not fall off immediately, but opens very gradually, like the lid of a box, and thus affords time for the reproduction of the new scale. Dr. Deschamps has collected some curious facts about this animal's tenacity of life. Francesco Redi having deprived the tortoise of his brain, found he could live six months without it; he cut off the head of another, but even this did not prevent the heart from beating for twelve days after the operation.

## RHUBARB JUICE.

At a recent trial of a case before the Circuit Court of Middlesex county, N. J., in which the matter of dispute was the value of the so-called "Myatt Lynnæus Wine Plant," Prof. G. H. Cook, of Rutgers College, testified that he was acquainted with the plant bearing the botanical name of *Rheum Raphonticum.* The Myatt Lynnæus is one of the varieties cultivated in gardens, and used for making pies. It is not known as a wine plant. Pure wine is the fermented juice of the grape, which contains sugar and tartaric acid. The alcohol present in the wine is always produced by the sugar in the grape. In the Myatt Linnæus plant there is no juice that will produce wine; one of its ingredients is oxalic acid, which is poisonous, and if not removed from the juice before it is prepared as a beverage, would be injurious to health. The juice of the apple contains malic acid and sugar, and for this reason he did not regard cider as a healthy beverage. He had made experiments with the rhubarb plant in question, and was satisfied that for wine it is almost worthless. He had boiled its juice, and abstracted the oxalic acid by means of lime. In all his tests he had failed to get the least particle of sugar, which is a necessary ingredient in a wine plant or berry.

### VEGETABLE HAIR.

On the mountains of the Sierra Nevada range, a plant called "soap root" grows in unlimited quantities. It is a bulbous root, enveloped in a very tough fiber, resembling somewhat the husk of the cocoanut. These roots, which are gathered with the spade in large quantities by Chinamen, are first put through a picker, similar to a threshing machine, which separates the fiber into hairs, eight or ten inches long; these are steamed to free them from gummy matter, then dried in the sun, and afterward twisted into ropes by machinery. They are steamed again to set the curl produced by twisting, then bound in bales and sent to market. The color of this prepared fiber is dark brown, and resembles curled hair. This new material is now largely employed for beds. An examination of it after more than two years' use, proved that it had been but little injured by wear. It is said moths will not attack this substance as they do animal hair. An enterprising firm of Boston has introduced the California vegetable hair into our markets. We understand it can be afforded in the form of hair rope at the rate of twenty cents per pound. Specimens of this material may be seen at the American Institute exhibition.

### ASPHALT PAVEMENT IN PARIS.

Asphalt pavement was first introduced in Paris in 1854 by M. Momberg, Chief Engineer, and M. Vandrey, Engineer of the Municipal Service of the city, The first street paved in this manner was Rue Begere, and since that time a great number of streets in the central part of the city have been thus improved. The so-called asphalt used for this purpose is a natural composition, containing about thirty-four per cent of carbonate of lime and sixty-six per cent of bitumen, found at Seyssel, in France, and at Val-de-Travers, in the Canton Neuchâtel, in Switzerland. This bituminous stone is crushed to powder by machinery, and afterward heated to about one hundred and forty degrees C. It then has about the consistency of molders' sand, and, on being reheated, it is applied to the streets, which have first been covered with a layer of concrete, made of gravel and cement. The asphalt layer, nearly two inches in thickness, is first compressed by means of rams, worked by hand, and then made smooth by means of different rollers, the heaviest weighing four tons. In two or three hours after last rolling the road is ready for use. No dust or mud is made on this noiseless road. The average wear per annum on the busiest streets does not exceed one twenty-fifth of an inch.

## *PETROLEUM TO REMOVE SCALE IN BOILERS.*

In regard to the scientific item in relation to anti-incrustation, it was stated that a little petroleum put in steam boilers would prevent incrustation. Mr. Root stated, that such had been his observation, and upon being asked how it could be applied in boilers when filled with water and steam, he said it could not be, but it might be placed in the boiler before the water was let in, and, as the boiler filled, it would sufficiently coat the iron by adhering to it as it floated upon the water. Mr. Pepper confirmed the observation of Mr. Root, and stated that petroleum would not only prevent but would remove scale, and this could be done by burning the kerosene in the boiler. Mr. Callow said that he was fearful that scale removed by burning would cause the boiler to leak at the joints, and that, with the apparent benefit, much subsequent injury might ensue.

## *IMPROVED CANAL BOAT.*

Mr. William Frick, of Chester, Pa., exhibited a model and explained his method of operating sectional canal boats. The boat is made in two sections, which are hinged together one in advance of the other. This rear section is supplied with a rudder, and can be steered similar to an ordinary boat; but the great improvement consists in using the rear section as the means of guiding the leading one. This is accomplished by means of a steering wheel placed in the bow of the rear section, and so arranged, that when it is turned as in the act of steering, the bow of the boat or section to which it is attached is thrown to the right or left of the leading section. The boat are especially adapted to canals in which there are short curves, and has been introduced upon the Susquehanna canal. The sections can be built one hundred feet in length, and with the same crew and one horse or mule, additional two hundred tons of freight or coal can be easily carried.

### *SHIP'S WINDLASS.*

Mr. Wetmore presented a model of a ship's windlass. When the capstan was rotated it turned a screw engaging the windlass-barrel. Pawls are so arranged as to engage the ratchet-wheel of the windlass, and so relieve the screw of strain when the vessel to which it is applied is riding at anchor. Greater power and economy of space were the claims over the old form of windlass.

### *IMPROVED TRY-SQUARE.*

Mr. John Burgum exhibited his improved try-square. In exterior it resembles an ordinary try-square, but the peculiarity consists in a double blade, with a square bar extending lengthwise through the center of the space. Upon this bar are hinged a number of cross-pieces, with a mortice in each sufficient to permit a small vertical movement upon the bar. This bar permits these cross-pieces to drop below the lower edge of the blade. Placed upon an uneven surface, the unevenness is indicated by the raising or depression of the cross-pieces.

### *AUTOMATIC BOILER-FEEDER.*

Mr. L. J. Knowles, then explained his patent boiler-feeder by means of diagrams upon the blackboard. It consists of two brass pipes connected at one end by a return coupling; the other ends are connected one with the steam-space and the other with a water space of the boiler; by this means the water in the apparatus remains at the same level as the water in the boiler. To the end of the upper pipe is attached a lever which regulates the feed-cocks, and the end of the lower pipe stands against the valve of an alarm whistle. If the water falls below the level of the upper pipe, steam will enter and cause it to expand, moving a lever and starting the pump, which will then fill the boiler and pipe, causing the latter to contract, reversing the lever and stopping the pump. In case of failure of the pump working, the water will continue to exhaust until it reaches the level of the lower pipe, which will expand against the whistle and cause an alarm. About 2,200 of these machines are in use at present.

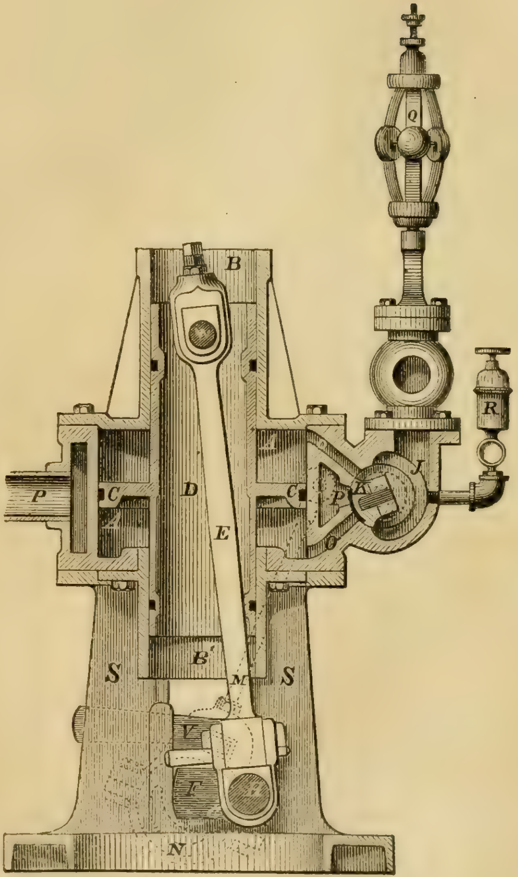
### A TRACK CARRYING-CAR.

Mr. Kershaw exhibited a model of a section of a railway car carrying its own track. The wheel of the car is inclosed in a rim or ring of several times greater diameter than that of the wheel, which, as it revolves, forces the ring to turn, forming the track as the wheel runs on its inner periphery. The plan was considered ingenious, but of no practical utility.

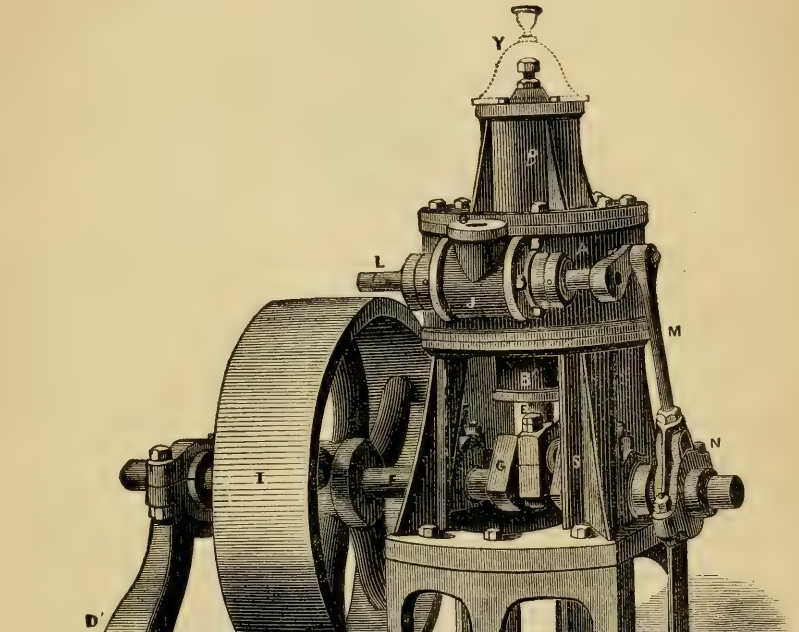
### ROOT'S TRUNK ENGINE.

Mr. John B. Root exhibited diagrams of his new steam engine, now on exhibition at the American Institute Fair, and explained its construction as follows:

"Figure 3 represents a vertical section, and Fig. 1, a perspective view of the engine; the same letters referring to the same parts in each. The cylinder, *A*, is cast with the exhaust chamber, *P*, running entirely around it; thus jacketing the cylinder with exhaust steam and preventing the condensation that takes place in the ordinary engine, where the cylinder is exposed to the atmosphere. The steam chest, *J*, and the lower cylinder head are also cast on the cylinder. The trunk, *D* (shown in perspective in Fig. 4), passes entirely through the cylinder and cylinder heads, and has a reciprocating motion given to it by the pressure of the steam alternately upon the upper and under sides of the piston, *C*, which is cast on the trunk. Within this trunk the connecting rod, *E*, swings, and and is connected with it by the cross pin, *W*. The connecting rod imparts motion to the shaft, *F*, by being connected with it by the crank, *G*, and crank pin, *H*. The trunk is kept in line while reciprocating by the upper guide, *B*, cast on the upper cylinder head and lower guide, *B'*, bolted on the lower cylinder head, thus relieving the cylinder and piston from side wear. As the insides and ends of the cylinder and guides, faces of cylinder heads, and the outside of the trunk and piston are all turned and fitted up in a lathe, the piston must necessarily run true with the inside of the cylinder, or, in other words, the centers of the cylinder, both guides, trunk and piston, must always be in one line. Around the edge of the piston, at *a*, and around the ends of the trunk, at *b* and *b'*, in Fig. 4, are turned grooves, in which are inserted the steel packing rings, Fig. 5, which rings being turned eccentrically with the middle, at *f*, the thickest, and gradually tapering in thickness



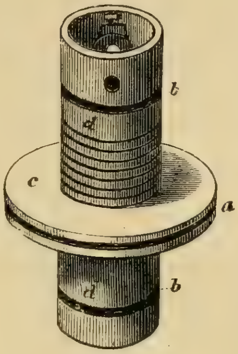
ROOT'S TRUNK ENGINE—Section.



ROOT'S TRUNK ENGINE—Perspective.

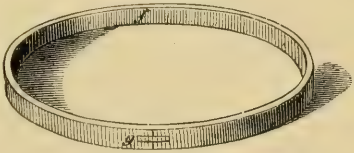
# ROOT'S TRUNK ENGINE.

*Fig. 4.*



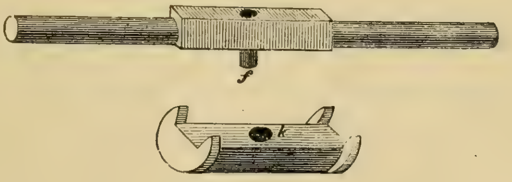
TRUNK.

*Fig. 5.*

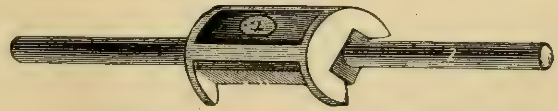


PACKING RING.

*Figs. 6 and 7.*



VALVE.



VALVE.

to the ends, at *g*, exert a uniform pressure outward throughout their entire length. Leakage, at *g*, where the rings are cut, is prevented by the insertion of a tongue. Steam is also admitted under them, thus securing constant pressure and tightness. The steam chest, *J*, is bored out, and the face of the valve, *K*, in Figs. 1 and 3, is an arc of a circle of the same diameter of the steam chest. The valve is a separate piece from the valve stem, *L*, Figs. 1 and 6. Projecting from the face of the stem is the radial pin, *f*, which fits into a corresponding hole, K, in the valve. The valve is worked by this pin, but is not held rigidly by it, and is left free to adapt its face to the valve seat independently of the wear of the line of the stem. The stem is worked in the usual manner by the eccentric, *N*, and valve rod, *M*. The course of the steam through the valve, steam ports, *O*, cylinder and exhaust port, *P*, will be readily understood. The heater is not shown in Figs. 1 and 3; but the way in which it is attached will be seen at *e*, in Fig. 2. Its form or location may of course be varied, as desired. *Q* is the governor; *R*, the oiler. The frame *S* is bolted on the lower cylinder head. *T* is the bed plate; *U*, pedestals; *V*, the key to tighten the journals; *D′*, outside bearing; *I*, fly wheel; *Y*, cap or cover over the trunk.

" Since the cuts were made, I have greatly improved the manner of attaching and driving the force pump, and made other improvements, having introduced an entirely new set of patterns."

Mr. Root set forth the advantages claimed to be gained by his engine, which may be thus briefly stated: Highest economy of fuel, owing to greatly diminished dead weight and reduced friction; greatest durability and least liability to get out of repair, owing to extreme simplicity and fewness of parts (having but two parts between the steam and crank pin, viz: trunk with piston cast on it, and the connecting rod); and also to light side strain and wear, and having large wearing surfaces; extreme compactness, the 20 horse power occupying a floor space of 3x4½ feet, and the 40 horse power 5x6 feet; very light total weight, making a great saving in freight and handling, and, owing to this and simplicity of construction, great saving in the cost of foundations and erections.

In engines of this character, as formerly built, there was much strain and wear upon the cylinder, piston and stuffing-boxes, resulting from the short connecting rod, which was attached to the trunk at the center and opposite to the piston-head, but he had obviated these defects by lengthening the connecting-rod and attaching it to the end of the trunk opposite to the crank-shaft, thus nearly doubling its length, and greatly reducing the angle at which it works. By this arrangement all side strain or wear is removed, and the point of connection is easily accessible. Mr. Root also explained that the compactness of the engine was one of its claims of merit, and showed the advantages of a quick-running engine over that of a slow one.

The usual hour of adjournment having then arrived, no other engines were explained; and the meeting was declared adjourned for one week.

## October 17, 1867.

Prof. S. D. Tillman in the chair; J. Wyatt Reid, Esq., Secretary.

The Chairman opened the proceedings by reading the following summary of scientific news:

### IMPROVED SWING-SPAN.

The great swing-span in the new iron bridge across the Harlem river, connecting the city of New York with Westcsester county, is moved over half a circle, having a circumference of five hundred and sixty-five feet, by means of water power supplied by the Croton aqueduct. The engine is so arranged that either water or steam may be used as the motor.

### GREAT RAILROAD BRIDGE.

The bridge now building across the Mississippi, at Quincy, will be completed in September, 1868. It will be the longest bridge on piers in the United States, and will measure one mile and four rods. Its main draw is three hundred and sixty feet in length; it has a smaller draw eighty feet long; both are worked by steam. The estimated cost of the bridge is $1,250,000.

### THE ANEROID BAROMETER.

Dr. Stewart, of the Kew Observatory, has made a series of experiments with this barometer, under different pressures, and concludes that on taking this barometer up a mountain twelve thousand feet high, it would indicate the true height within three hundred feet. There are, however, serious objections to the metallic barometer, not fully set forth by Mr. Stewart, which should prevent its use for strictly scientific purposes.

### ALABASTER.

Immense beds of pure white alabaster have lately been discovered by Mr. Frederick Kelly in the vicinity of the great rock-salt deposit on the island of St. Domingo. This variety of gypsum is a hydrated sulphate of lime, with two atoms of water (*ellt calmasot*). It is largely used as a coating for walls and ceilings. Specimens of the St. Domingo alabaster have been examined by several builders of New York, and pronounced of superior quality.

### COAL IN NEW GRANADA.

Valuable beds of coal have been discovered in the State of Bolivar, in the highlands bordering the river Sinu, about one hundred miles south of the city of Carthagena. The coal is found in five distinct veins, each from three to five feet in thickness. It is bituminous, and similar in quality to the coal of Richmond, Va. These veins were lately examined by Prof. R. P. Stevens, of the American Institute, who will soon report upon their economical value for generating steam.

### KILLIKINICK.

This name, designating a certain brand of smoking tobacco, originated with North American Indians, who still apply it to the shrub commonly known as red willow. It grows in great abundance along the shores of northwestern streams and lakes. The Indians of Wisconsin prepare it for smoking by removing the outer bark, and then scraping off the inner, which is dried by being held over a flame. After being pulverized it is ready for use. Its effect is said to be more exhilarating than tobacco. The bark of the root is a valuable remedy for putrid sore throat, ulcerated tonsils and canker rash.

### MAGNETISM.

In a discussion on this subject before the British Association, Sir William Thomson took exception to the remark that magnetism, like electricity, distributes itself upon the surface of bodies. The same statement had been made by authors of repute, but it only added proof of the fact that in many popular books there were statements not merely false in theory, but false as being in direct opposition to facts published many years ago. Harlow, in experimenting with bars of iron, found, long ago, that the magnetic influence was not discoverable. His experiments were not carefully made, yet he rashly stepped to the conclusion that magnetism resides at the surface; and, although is was soon proved incorrect by a celebrated mathematician, this statement has been the fruitful parent of many fallacies.

### BULLET PROBE.

Mr. Sylvande Wilde has invented an instrument for extracting bullets in wounds, which has been aptly called a sensitive artificial finger, for its action depends on the actual presence of the bullet sought for. It consists of two insulated steel wires, which are connected with an electro-magnet and a bell, so arranged that the electric circuit will pass through the two wires whenever they are connected by contact with the same piece of metal, which will form a part of the conductor. The points of the probe are sheathed in a sliding tube when introduced into the wound, and are not uncovered until the supposed bullet is felt. The forceps have curved points, and are not pallets or spoons. When the ends of the probe are uncovered, on touching the bullet, the latter completes an electric circuit, which sets in motion a magnet, and by its attraction compels the forceps to grasp the bullet; it is then ready to be drawn out.

### PROCESS FOR PRODUCING HYDROGEN.

M. Heurtebise describes in a late number of *L'Invention* an economical method of obtaining hydrogen gas. He places charcoal in a retort, and raises it to a red heat; then passes over it a stream of carbonic acid, each molecule of which absorbs two atoms of oxygen, thus forming carbonic oxide (*garat*). Into another red hot retort he passes a current of steam and the gaseous contents of the first retort, and the products in the second retort, resulting from the decomposition of steam, are carbonic acid and hydrogen gases (*garat* and *gal.*), which are separated, and the carbonic acid is again used in the first retort. The interesting process, described as new in the French journal, has been long used in America, particularly by those experimenters who have aimed at mixing more hydrogen with the large class of hydrocarbons which are very rich in carbon, and therefore liable, from imperfect combustion, to give off fine particles of unconsumed carbon in the form of smoke.

### UCHATIUS STEEL.

The process of M. Uchatius, an officer in the Austrian service, for making steel by mixing granulated iron and iron ore in proper proportions in a crucible, was patented here many years ago by an American, and we believe before any similar plan had been tried in Europe. The process was never carried into practical operation for commercial purposes in this country; however, a large company was formed in France, more than ten years ago, for making steel under the Uchatius patents, but it failed to produce steel of uniform quality. The cause of its failure is now known to be the employment of improper ores. In Sweden this kind of steel has been made with great success, by mixing the very pure and rich magnetic ores of the Bisberg mines with granulated pig iron made from the same ore, and adding a little manganese or manganese ore. This steel is remarkable for its tenacity and uniformity of grain. It is used exclusively by the Royal Mint at Stockholm for dies of coining presses, polished rolls and other similar articles requiring great strength, closeness and regularity of grain.

Prof. Vanderweyde remarked that ferro-cyanide of potassium applied to iron, made a coating like steel, but it is so thin that it soon wears off on a tool which is often ground to sharpen it. He had made magnets in this way, but they were not of much account, as the steel did not penetrate far into the iron.

### THE COLORS OF SOAP BUBBLES.

At the late meeting of the British Association for the Advancement of Science, Sir David Brewster read a paper on this subject, from which it appears that he had been led to make some new investigations as to the cause of colors of soap bubbles, after he had repeated the beautiful experiments of Prof. Plateau "On the Equilibrinm of a Liquid Mass without Gravity." In these cases the colors of soap bubbles were presented to him upon soap films, plane, convex and concave; but the changes of form which they underwent, and their motions upon the film itself, were incompatible with the common theory of their formation. After describing various phenomena emitted by the ordinary soap bubble, and also with the bubble having its film toughened by a mixture of glycerine, Sir David remarked that his experiments were sufficient to establish the almost incredible truth that the colors of the soap bubble are not produced by the thickness of the film itself, but by the secretion from it of a new substance flowing over the film and expanding, under the influence of gravity and molecular forces, into colored groups of various shapes and returning spontaneously, when not returned forcibly, into the parent films.

At the conclusion of the paper, Sir William Thomson remarked that the mechanical questions involved in the seemingly simple operation of blowing soap bubbles were the greatest enigmas to scientific men. The extraordinary expansion and adhesion combined in the vapor spheres were well worthy of the fullest investigation.

### IMPROVED LAMP.

Mr. W. Willard exhibited his improved lamp for burning petroleum, which consisted in placing two movable jaws just above the wick, which, on approach or receding, regulated the size of the flame where petroleum is used, and also prevents the incrustation of the wick.

### BRICK MACHINE.

Mr. D. W. Seeley exhibited a model of his brick machine. No detailed description has been furnished for this report, but those who have used the machine speak highly of its simplicity and efficiency.

### IMPROVED KETTLE FOR THE KITCHEN.

Mr. John Gibson, jr., of Albany, exhibited an anti-scalding pot, by the use of which a child can decant, or pour out the boiling liquid from a pot or kettle with ease and perfect safety, an operation heretofore attended with great danger of scalding, even to a grown person.

The invention consists of a lug or ear placed on the side of the kettle near its base, said lug having a hole, into which a handle or hook is inserted, to lift or decant the kettle.

Another feature of the invention, is the securing of the cover in its position, so that it cannot fall off while the kettle is being emptied; the liquid passing through openings on one side of the cover, or the lid may be raised a little on one edge, to answer the same purpose. Thus vegetables, meat, &c., may be retained in the kettle while the liquid is poured out with ease and safety.

Cooking utensils now in use can have this new invention applied to them in a few moments, at our own houses, and at a trifling expense.

### CAR HEATER.

Mr. Gibson also exhibited his patent car heater. The stove is placed under the seat, on one side of the car, about equi-distant from each end. The ash box projects downward between the wheels, and a three inch smoke pipe passing under the seats to the back corner and then upward through the roof of the car. The whole is protected in such a manner that the wood work will not be overheated. After the fire is started a single pailfull of nut coal is sufficient to keep the car comfortably warm in the coldest day. The heater has been successfully applied to cars at the North.

Mr. Julius Silversmith spoke on mining metallurgy.

## *ROOT'S SECTIONAL BOILER.*

Mr. John B. Root illustrated by diagrams on the blackboard his wrought iron sectional safety boiler, which is fully explained in the following paper, furnished by him:

The essential features to which this boiler owes its entire safety from explosion, are the small diameters of its parts and the subdivision of the water and steam in small compartments. It needs no argument to show the superiority, in point of strength, of small over large diameters; the tubes used are four inches in diameter and one-eighth of an inch in thickness; they are as strong as twelve inches in diameter and three-eighths of an inch thick, or twenty-four inches diameter and three-fourths of an inch thick, or thirty-six inches diameter and one and one-eighth inch thick, or forty-eight inches diameter and one and one-half inch thick, and so on in proportion to diameter. There is a further advantage in favor of the strength of tubes, such as used in the safety boiler; they have no riveted joints; while boilers of large diameters are always made of sheets and riveted, which diminishes their strength from thirty to forty-four per cent, as compared with a solid cylinder. The above extreme thicknesses are never seen in practice, but the diameters are common.

These tubes are made of iron that will bear 45,000 pounds per square inch tensile strain, across the sheets. They are all tested at 300 pounds pressure per square inch, and are good for two or three times this pressure.

Their immense strength to bear pressure is principally owing to their small diameter; but also to the use of the best charcoal iron in their manufacture.

The circumference of a boiler shell of four feet diameter is 150 inches; hence if the pressure usually carried is fifty pounds per square inch (many carry 100 to 150 pounds), there is constantly being exerted upon each inch in length of the shell a bursting pressure of 7,500 pounds, and if the boiler is fifteen feet or 180 inches long, the entire pressure, which is tending to rend the boiler asunder, amounts to the enormous total of *one million three hundred and fifty thousand pounds*, or if the boiler is carrying 100 pounds per square inch, *two million seven hnndred thousand pounds.* Startling as these figures may appear they are correct, and are far below the actual facts in many cases, as, for instance, a boiler in a steam flouring mill in New York city has a diameter of about *seven feet*, and hence circumference of about twenty-two feet or 264 inches, and sixteen feet or 192 inches in length, or an area of shell of 50,688 square inches, which multiplied by ninety pounds, the regular pressure, gives the total of four million ten hundred and sixty-one thousand nine hundred and twenty pounds as the pressure constantly sustained by the shell, not including the tubes or tube sheets. This boiler is being overworked to a dangerous degree, so much so that the sheet iron smoke pipe leading to the stack is often red hot.

It is surrounded by a very valuable property, and many lives are hourly exposed to the terrible consequences that would result from its explosion.

The tubes used in the safety boiler are four inches in diameter, or say twelve inches circumference by ten feet or 120 inches long, having an area of 1,440 square inches, hence at fifty pounds the total bursting pressure is but 72,000 pounds instead of 900,000 pounds, which would be the pressure in a shell four feet in diameter and ten feet long.

Haswell says, in his *Engineer's and Mechanic's Pocket Book:* "The resistance to *collapse* of a flue or tube is much less than the resistance to *bursting.*" Experiments show about one to two. This is an important point, as our tubes are subject to *bursting* strain only, and hence are stronger than in the ordinary boiler. The tubes in the common forms of boilers are, however, many times stronger than the shell.

It is a well-known practical fact, that boiler tubes do not *explode*, as is the case with the shells of boilers; but that excessive pressure, many times greater than the shell will bear, merely causes a rupture of greater or less extent, and thus relieves the pressure without serious damage.

Each of these tubes, containing but a small amount of water or steam, might be ruptured withont dangerous results, thus relieving the boiler and preventing disaster.

The first form of boilers, the plain cylinder, being very uneconomical in fuel, and occupying the greatest space per horse power, has been in a measure superseded by the flue boiler; and this, still uneconomical, by the tubular, in its many varieties. The use of tubes greatly reduced the space occupied; and by subdividing the water and introducing a large amount of heating surface composed of thin iron (tubes), accomplished another very valuable result—economy of fuel.

The tubular, however, still retains the dangerous shell, intrinsically weak, owing to its large diameter. It is this shell, containing the whole volume of water and steam, that always, or nearly always, explodes, and usually resulting in fearful havoc.

After years of use, the difference in expansion between the shell, fire box, tube sheets, and tubes, works the ends of the tubes loose in the tube sheets, and while they are nearly as good as new, except half an inch at the ends, they have to be thrown aside and replaced by new ones, because re-expanding them to make them tight has injured the ends.

It is the shell and fire box that require frequent patching: these repairs constantly weakening the remaining portions of the sheets, as it is well established that a single riveted joint has but fifty-six per cent of the strength of the plate before punching and riveting, and this with the best workmanship. This shows that the tubes are the most durable part of the boiler, and the only damage they suffer is due to irregularity of expansion and contraction, which fault is avoided in the boiler under consideration. Boilers made with shells may bear a high degree of cold water pressure when all parts remain at one temperature; but the application of heat on one side may produce such immense strain by inequality of expansion, as to nearly break up the boiler without steam pressure. This explains why some new boilers burst at the first firing, after having borne the cold-water test. The parts of the safety boiler being uniform in length and size, will expand and contract equally; but any inequality would have no bad effect, owing to the manner of attaching the parts together.

This uniformity of parts in size renders the largest boilers as strong as the smallest, which is not the case in the ordinary forms; and hence large marine boilers are usually worked at very low pressures, it being regarded as dangerous to carry high pressures, on account of the weakness inseparable from the common forms of construction.

The principal causes that operate to produce explosions in the old style of boiler, are inequality of expansion, caused by one part of the boiler becoming heated to a greater temperature than other parts; the water getting too low, and exposing parts where there is no water to the fire; sediment or incrustation being deposited upon the plates, preventing the water from contact with the iron, and thus causing the plates to be overheated or burned; faulty construction; leakage, causing oxydation or rusting away of the iron; ignorance or carelessness in their management or construction. A volume might be written setting forth the facts and causes of boiler explosions; it is sufficient to know they do explode; that with the utmost care the danger is very great. It is often remarked by those who have had great experience in the use of steam, that the more they know of the subject, and the more experience they get in regard to the old style of boilers, the greater is their fear of them. We claim that an *explosion* with the safety boiler is impossible. It may become overheated in parts; there is no strain thrown upon other portions by unequal expansion, as each part is at liberty to expand independent of other parts. It may become filled with sediment if neglected, and the tubes may burn; they are easily replaced, and no danger can ensue. It may be ignorantly, carelessly or maliciously treated, yet no *explosion* can occur. Tubes, such as are used in the safety boiler, cannot be *exploded*; they may be ruptured by excessive pressure, say ten times that which would explode a large shell. In short, we claim for the safety boiler entire and absolute safety from explosion; not that accidents might not occur, by which persons in charge of or around the boiler might be scalded; but such a thing as blowing down buildings and endangering the lives of all in or around them, is impossible.

Safety in steam boilers should be the first consideration; but, unfortunately, it is not always the case. It has been only of late that safe boilers have received the attention they deserve. Most people do not appreciate the danger that is inseparable from the old styles of boilers with large shells. No business man would think his property safe if not insured against fire; yet we will venture to assert, and feel sure that statistics will verify the assertion, that the risk from boiler explosions is two-fold greater than the risk by fire; that is, the number of explosions, compared with the number of boilers in use, is far greater than the number of fires compared to the number of buildings; and unsafe boilers endanger life as well as property.

It would seem that considerations of safety to the life and property of the purchaser, if not to that of others, would dictate the utmost caution in the selection of what has in too many instances proved a terrible engine of destruction. Yet a slight reduction in price, made by some unprincipled manufacturer, often secures the contract, and an accident, which in many instances should be termed murder, is the result.

The remark is very common that boiler explosions result only from carelessness; but it is an indisputable fact that the best boilers of the ordinary forms, made by the most eminent firms, of carefully selected materials, fitted with the most perfect appliances for safety, and in the hands of sober and competent engineers, are constantly being exploded in all parts of the country. It is also true that the opinions of the highest authorities differ widely, or totally fail in giving satisfactory explanations of these terrible disasters.

Taking these two facts into consideration, will not the best practical results be obtained, by first making a boiler of such form and dimensions that it will sustain great unusual pressure without rupture; and second, by dividing up the explosive force, so that when the ultimate strength of the parts is exceeded, the rupture may be rendered harmless?

It will certainly be conceded that no boiler having its entire contents of water and steam in one body, and liable to be discharged instantly, carrying death and destruction with them, can be regarded as safe.

It has been well demonstrated by practical results, that the highest degree of safety can only be found in sectional boilers. This form also offers other important advantages, alluded to in another place.

The safety boiler has no joints in the fire or out of sight. Such joints are very dangerous features of many boilers, causing rapid wearing out; and many explosions, resulting from the weakness produced by corrosion.

### ECONOMY OF FUEL.

Having discussed the first requisite of a steam boiler, safety, we turn to what is certainly next in importance, viz: economy of fuel.

It may be unnecessary to mention, that in order to sustain perfect combustion, a large and constant supply of oxygen, or atmospheric air, must be furnished for admixture with the gaseous products from the fuel. It will be conceded that it is impossible to introduce sufficient air into the fire-box end of a boiler tube of one and a half or two inches diameter, and say twelve to sixteen feet in length, to sustain perfect combustion more than five to six feet from the end of the tube. The most exhaustive experiments have demonstrated that but about five feet of the tubes in ordinary boilers are of any value in making steam.

In the safety boiler, the spaces for admixture of the air and gases of the fuel and for combustion, are ample, extending the whole length and width of the boiler, between the rows of tubes. This peculiarity of construction in this boiler makes it—we think it will be acknowledged on examination—the most economical in fuel of any steam generator produced. The tubular boiler, notwithstanding its imperfect combustion, is, owing to its large proportion of tube surface, the most economical form; but the safety boiler is composed entirely of tube surface, and it is all effective, on account of perfect combustion. We have thrown out the thick shell which is the uneconomical portion of the tubular boiler.

There are certain conditions necessary to obtain the best economy in any boiler, viz: proper combustion of the fuel, and a proper amount of heating surface in contact with the water to absorb the heat evolved by the combustion of the fuel. In order to obtain complete combustion, it is necessary to have a sufficient amount of air mixed with the gases of the fuel to support such combustion; and sufficient combustion room above the fuel to permit the thorough admixture of the air and gases. The want of properly arranged and sufficient combustion room is the cause of great waste of fuel, as the gases in such cases pass off without being burned. It is also necessary that a proper amount of grate surface should be given, to correspond with the heating surface of any boiler. The required proportion between grate surface and heating surface, and combustion room varies under different conditions, according to the amount of draft, the kind of fuel used, &c.

Now, a great point in favor of the economy of the safety boiler is its adaptability to any and all conditions of use. While other boilers are confined to the proportions, in these respects, upon which they were originally constructed, the safety boiler can be erected to conform to any required conditions. The amount of heating surface, grate surface, combustion room, etc., can be proportioned and arranged in any manner required to suit the conditions under which it is to be used, or can be changed after erection with little trouble. The thinness of the metal of the tubes is also in favor of economy. All the heating surface is one-eighth of an inch in thickness.

The strong circulation prevents the deposit of sediment in the tubes, and increases their effect. The facility with which they can be cleaned and kept clean, both outside and inside, enables its economy to be maintained even after long use, which is well known is not the case with the ordinary form of boiler.

The lodgment of ashes, soot, &c., in the concave surfaces of the flues and tubes of common boilers, reduces the economy of these forms greatly.

This is especially the case where the fuel used produces a large amount of ashes and dust, as in shavings, saw-dust, spent tan bark, &c. In the safety boiler the ashes can lodge upon but a very small part of the convex top surface of the tubes, and the draft will sweep this off quite effectually. A steam jet will keep the outside of the tubes perfectly clean.

In every case where it has replaced other boilers, or put to the same work, it has shown the most remarkable economy.

It is a very rapid generator, raising steam to start the engine in twenty to thirty minutes from cold water, while many boilers require from one to two hours.

## DURABILITY.

Much that has been said on the subject of safety also applies here, and is not repeated.

The destructive action of irregularity of expansion and contraction, which is constantly at work in all other forms of boilers, does not take place in this, as any two or more tubes, lying side by side, expand and contract nearly equally; still, any inequality would have no bad effect, owing to the manner of attaching the parts together. It is this force that, in the ordinary boiler, is always tearing the tubes loose where they are expanded into the tube sheets, loosening rivets along seams, and throwing an enormous strain upon all parts of the boiler, thus explaining many explosions.

The safety boiler has no narrow, inaccessible water spaces or 'legs," as in the locomotive or upright tubular, where the sediment settles, often causing burning of the plates and explosions. This is an important element in its durability, as all who are familiar with the frequency of "soft patches," &c., will understand.

The question may be asked: Are the tubes as used in the safety boiler as durable as they would be in other boilers? We think they are much more durable, as the fire does not attack the ends as severely as in the locomotive or upright tubular boiler, for instance; and they have to stand no more heat than in other kinds of boilers in common use. The fact of its being composed of uniform parts, any one of which can be removed with little trouble or expense, is greatly in its favor. We see, almost daily, boilers of the old style taken out and replaced by new ones, for fear of their being unsafe; or that they may be weakened in some part by burning away, corrosion or other causes, which it is well known often occurs, and is in many cases impossible to detect. Nine-tenths of the boiler may be perfectly sound; but from the fear that a weak point may lead to an explosion, the whole is discarded. In the safety boiler no such danger exists; the defective part can be replaced, and sound parts retained for further use.

Thus the strength of all parts of this boiler can be maintained at its highest point for a much longer term of years than in the common forms, and with but slight expense, if any. When a change in size of boiler is required, and small boilers are replaced with larger ones, or the contrary, the old boilers are of little value, as no one will give much for a second-hand boiler; while the safety boiler may be used as a component part of a larger one, or be divided into smaller, as the case may require, all of which is in favor of its lasting value.

### SCALE AND SEDIMENT.

As this matter of scale and sediment is the greatest difficulty met with in steam engineering, and more loss, trouble, and danger occurs from this cause than from any other, I wish to have the points of superiority of this boiler thoroughly understood, and it will be much to the interest of those owning steam boilers, *of any form*, to see that those having them in charge attend properly to this matter.

Practical engineers have noticed that wherever, in any boiler, there is a strong and constant current, at that point the sheet or tube remains clean and free from incrustation. The circulation of the water through all parts of this boiler is very rapid, and our experience with those of our boilers that have been in use the longest shows that they possess this valuable feature of remaining free from scale, and the deposit of sediment in the tubes, to a remarkable degree.

We claim this boiler to be superior to any other known form, in the ease with which it can be thoroughly cleaned, if, through neglect, it becomes incrusted; and if, through such neglect, any damage should be done to any part, it can be renewed with a trifling expense of time or money; and such want of care, which is the cause in other boilers of so many explosions, with loss of life and property, in this boiler cannot cause the least damage.

The strong circulation prevents sediment from adhering to the inside of the tubes, unless allowed to accumulate from carelessness, while the inclination at which they are set causes all sediment to descend into the water cross-pipe, or mud-drum, where the water is at rest, and beyond the contact of the fire, and to remain there until blown out as directed.

If the blowing off is attended to as often as the impurity of the water demands, the operation of this boiler, as far as sediment is concerned, is perfect.

If, through inattention, there should be an accumulation of scale, by the use of solvents, in the form of molasses, sugar, petroleum. or other forms, it can be loosened or blown off; or by removing the return bends at each end of the tubes, access is given to the inside of each tube for the removal of any deposit it may contain.

The water cross-pipe, or mud-drum, is easily detached, or can be cleaned through the ends by removing the heads.

If any tube should be damaged, it can be taken out and replaced by another, in an hour, without disturbing any other part.

It is well known that neglect of proper cleaning, in boilers with large shells, is the cause, in many cases, of disastrous explosions. On the Mississippi river, where the safest form of the old style boiler are used (cylinder and flue), the explosions have been fearfully frequent, and are well known to be caused, almost entirely, by the great amount of mud and sediment contained in the water, and deposited in the boilers, preventing the water from contact with the plates, and causing them to burn out. This damage occurs, to a greater or less extent, in all cases where sediment is allowed to accumulate.

I claim that in the safety boiler all danger of explosion in such cases is avoided, for the reason that it is impossible to explode a tube such as used, owing to the small volume of steam or water that it contains, in proportion to its strength. It may get red hot, or burn out so that it will leak and require replacing, but it will not explode.

In a large shell, say four feet in diameter, which is a common size, if it becomes weakened by burning out, or other causes, in any part, the internal surface upon which the pressure of the steam or water is exerted is so great that it is immediately burst open at the weakened point, and rips or tears from that point in any direction, like a piece of cloth, and the whole expansive power of the heated water and steam is immediately liberated, dealing destruction around.

In a tube of four inches in diameter, the result is different; its strength to resist internal pressure is from ten to twenty times that of the four-feet shell, and, if burned entirely through at any point, its strength is so great, in proportion to the internal surface exposed to pressure, that no such thing as explosion or tearing open can take place. A mere leak occurs, and the boiler may be used with safety for weeks after the leak occurs, or until the leakage is so great as to prevent the use of the boiler.

No such thing as the burning out of a tube can take place, unless for the want of water, or its being filled with sediment; in either case, the result of great carelessness or neglect.

It is demonstrated by experience that this boiler, with proper treatment, will remain free from deposit inside; the water circulation is very rapid and perfect, and its tubes being straight, and having no large slack-water spaces, the strong current will blow it out very thoroughly and clean. There are no corners for the lodgment of sediment.

### CONVENIENCE FOR EXAMINATION.

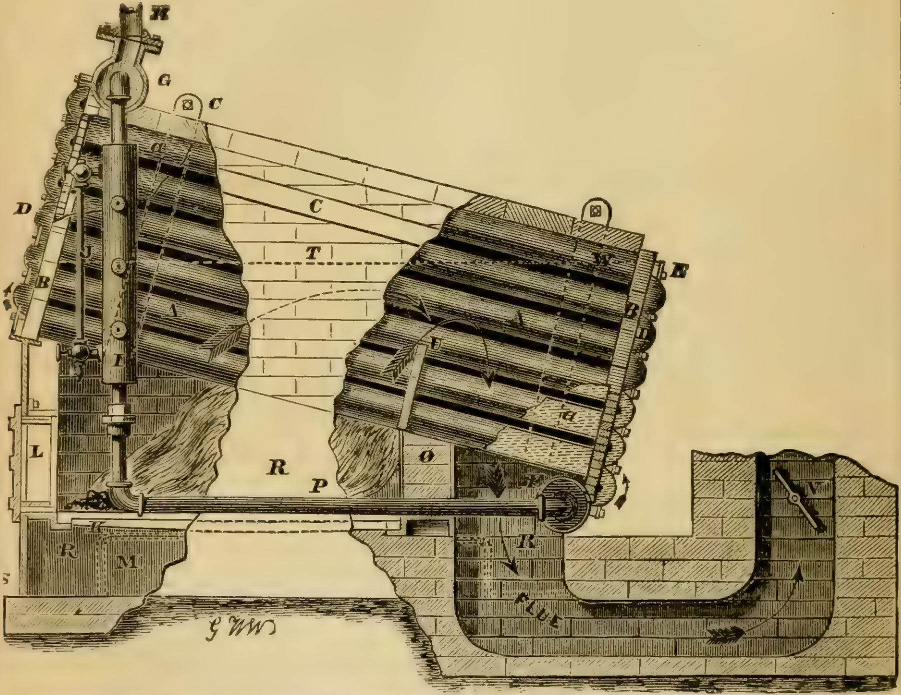
No other boiler yet made presents such perfect accessibility and convenience for examination of the inside; as by loosening the nuts and removing an elbow bend at each end, the inside of any tube can be examined in a few moments; and by taking off two bends at each end, any tube can be quickly removed without disturbing any other portion of the boiler; and in case of injury, a new one can be inserted in its place in an hour, or by putting caps in place of the removed bends, the boiler may be used without a portion of the tubes.

The outside of the tubes can be thoroughly and easily cleaned with a steam jet or brush, through several small doors left for this purpose at front and rear ends, and at both sides. This effects an important saving in fuel.

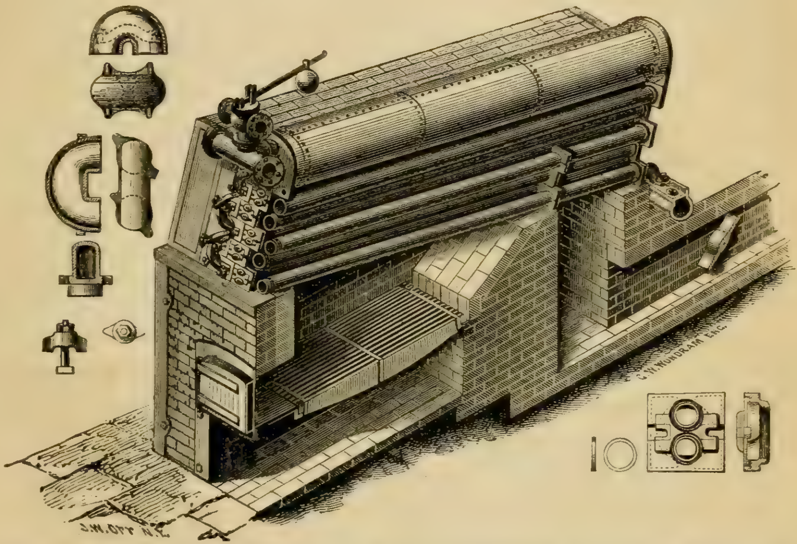
As before mentioned, but very little soot or ashes will remain upon the tubes, thus greatly reducing the trouble on this account that occurs in other boilers.

### ENLARGEMENT OR REDUCTION OF SIZE.

Another important advantage is convenience of enlargement or diminution of size; as a forty-horse power may be cheaply made



ROOT'S WROUGHT IRON SECTIONAL SAFETY BOILER.


J.W. OTT N.Y.
C.W. WUNDRAM ENG.

ROOT'S BOILER WITH LONGITUDINAL STEAM DRUMS.

sixty-horse power by adding tubes at the top, raising up the steam drum and its connections, and building the side walls higher, but without disturbing the foundations or walls already erected; or it can be enlarged to any extent by taking down one or both side walls and adding tubes at the side, and top also, if desired. This is certainly a valuable feature.

If, for instance, a forty-horse power boiler of any of the ordinary forms is not large enough, it must be sold at a sacrifice, a larger one put in its place, at the full price, and the serious expense and loss of time from changing must be incurred. Or, on the other hand, a large safety boiler may be divided into smaller ones.

For a steady demand upon the boiler, as in driving an engine, it works well without any steam drum. Where large amounts of steam are required at irregular intervals, we have put on drums running across the boilers, of eighteen and twenty-four inches diameter. The longitudinal drums, running the whole length of the tubes on the same inclination, are preferred by some, as they give additional water and steam room, and are made twelve and eighteen inches in diameter, and of ample thickness, thus giving them great strength and safety.

There are no new conditions in this boiler, as putting the water and steam inside of instead of around the tubes, is not new, and has been in successful use for many years.

Its principal novelty, and which we claim as a valuable one, is the perfect simplicity of the mode of connecting the tubes together, and the uniformity in size and shape of its parts.

To sum up, we have thrown aside the *dangerous* portion of ordinary forms of boilers, the shell, which is also the uneconomical and destructible part, and have composed our boiler entirely of the safe, economical and durable portion, the tubes.

### DESCRIPTION.

The annexed illustrations represent this boiler with the walls cut away, so as to show the internal arrangement. The boiler is composed of wrought iron tubes, *A*, *A*.

Upon both ends of each tube are firmly screwed the cast iron heads, *B*, *B*, which form the front and rear ends of the boiler when laid up. These joints are necessarily tight, being screwed on in a lathe.

The tubes can be laid up in vertical rows, or each horizontal row may be pushed three inches or one-half the width of the square head, aside, which brings each tube over the opening between the two tubes below it, in which case the return bends that connect the tubes together are put on diagonally, as shown in lithographs.

In each head are two openings, *a*, *a*. Through these openings and the elbow bends, *D*, *D*, each tube is connected with the tubes above and below it. These elbow bends are held in place by clamps and stud bolts, *E*, locked into the heads. The ends of the bends are seated on rubber washers, *b*, *b*, vulcanized to stand high temperatures, thus making the joints steam and water tight. The lower horizontal row of tubes is connected in the same manner at the lower rear corner to the water cross-pipe, *F*, into which the feed water is forced, and the upper horizontal row of tubes is connected at the steam cross-pipe, *G*, at the upper front corner, from which the steam is taken to the engine through the steam-pipe, *H*. The fuel is burned on the grate bars, *K*, in the usual manner, and the flames and heat pass upward through the boiler, among the tubes, over the iron bridge, *U* (which extends up from the fire brick bridge wall, *O*), and pass out of the boiler through the flue. Where it is more convenient, the draft may be taken out at the top and rear of the boiler.

The corner stays, side stay bars, door frames and bearing beams hold the lower portion of the walls firmly in position, and the wall panels, cross and lengthwise stay rods keep the side walls and top in place. *L*, fire door; *M*, ash-pit. The water line is at *W*, and the large stand pipe, *I*, with its water connecting pipe, *P*, and steam connecting pipe at the top, with the glass water gauge, *J*, and try-cocks show the level of water in the boiler. *S*, floor line; *V*, damper in flue.

Adjourned.

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## October 24, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Secretary.

The Chairman presented the following summary of scientific news:

### DEODORIZATION OF KEROSENE AND COAL OILS.

According to Wagner, the peculiar odor of these oils is removed by treating them with a solution of oxide of lead in caustic soda.

### THE COLOR OF MARS.

Mr. Huggins, F. R. S., is of opinion that the color of the planet Mars is not due to the peculiar absorption or other effects of its atmosphere, but that the color has its origin in the material of which some of the planet's surface is composed.

### IMPROVED INSULATOR.

A new insulator for telegraphic purposes has been brought out in Philadelphia, which consists in giving the ordinary sulphur and glass insulator a coating of paraffine; this being a thorough repellant of water, is found to make the insulator more perfect in wet weather.

### THUNDER MADE VISIBLE.

Dr. Töpler focalizes a ray of light on the object glass of a telescope, which is connected with a screen in such a way that any disturbance of the air becomes visible; for instance, the intense sonorous vibrations of the atmosphere produced by electric explosions, show themselves in the telescope as visible rings or circles of light.

### METALLIC VEGETATION.

This new chemical toy is founded on the decomposition of a solution of silicate of soda and a metallic salt, such as crystalized chloride of iron, proto-chloride of cobalt, nitrate of uranium, or sulphate of protoxide of manganese. A tumbler, having a flat bottom, is first filled with silicate of soda of a density equal to 22° Baumé, and then small fragments of a salt are thrown in. After some hours a miniature forest may be seen, variegated by remarkable forms and most brilliant colors.

### THE SLAUGHTER OF CATTLE.

A series of experiments took place lately in Paris, with a view to try whether oxen might not be spared the frightful tortures it is supposed they endure on being felled with sledge-hammers. Physiologists had affirmed that the section of the spine will strike the animal down as if by lightning, but the experiments have not corroborated this opinion. Oxen not only showed signs of life, but gave evidence of suffering for more than fifteen minutes after this operation. Experiments were tried on sheep and calves with similar result.

### EXPLOSION EXPERIMENT.

The Paris *Cosmos* describes an interesting experiment, which may be new to many of our readers. A large bell-glass, full of air, is placed over water, and a stream of mixed air and hydrogen gas is slowly sent up through the water, so that each bubble of gas, as it escapes, meets the points of a Rhumkorff coil, and is ignited by the spark. The result is not a sudden explosion, but a succession of lighted bubbles, which continue their course within the bell-glass, describing a series of curves. The effect is most brilliant when the experiment is performed in the dark, the small flames then darting about and crossing each other's track in all directions, give the appearance of a bell-glass filled with fire-flies.

### BLACK CURRANT LEAVES.

The *Journal des Connaissances Médicales* contains an article on the virtues of the leaves of the black currant (*ribes nigrum*). These leaves, when green, are much used by country people for tea, in cases of difficult digestion. With sugar, this bevarage is agreeable, aromatic, and possessed of exciting properties. Mr. Blucher has distilled these leaves in the same way as those of peppermint, balm, &c., the operation being stopped when the liquid obtained is equal in weight to the substance employed. The leaves should be handled as little as possible, in order not to crush their odoriferous glands. This medicated water is a good vehicle for all stomachic potions, and will keep without change for two years.

### ANTHROPHOTOSCOPE.

This name has been given by Messrs. Rowell & Mills, of San Francisco, to their invention for mounting photographs. The new device consists in carefully divesting the likenesses of all those portions of card, paper, or other opaque substance representing the background, and not essential to the image which it is desired to preserve, and substituting therefor a background landscape on another plane, diverging upward from the plane to the likeness, and intersecting the latter at the feet. The effect of this arrangement is, that when viewed with both eyes through a magnifying lens, the receding landscape, the approaching foreground, and the double image, corresponding to the view of natural objects, are obtained, consequently giving a most vivid impression of life. By means of gearing, the figures may be collected in groups, or the scenery of the background may be varied at the pleasure of the beholder.

### FLUORINE.

Many attempts have been formerly made to obtain this highly electro-negative element in a separate state, but without success. M. Prat now avers that he has isolated fluorine by heating fluoride of lead either with nitrate of potash or binoxide of manganese.

The result of this operation is a gaseous mixture of oxygen and fluorine; from this the oxygen is abstracted by passing the mixture over heated oxide of barium (*baramat*). The binoxide of barium (*baramet*) is formed while the fluorine is left in the form of a gas. M. Prat states it is colorless, and has an odor resembling chlorine. It decolorizes indigo; reddens litmus; fumes on coming in contact with air; gives dense fumes with ammonia (*gilan*); decomposes water, as well as hydrochloric acid (*galad*); unites with hydrogen in diffuse light, forming hydro-fluoric acid (*alaf*); and last, it combines with all metals, excepting, perhaps, platinum and gold. M. Prat's experiments are to be repeated before a committee from the French Academy of Sciences. He seems to have selected a most direct path to success by first obtaining a mixture of two gases, which it is well known do not combine chemically.

### THE INTERNAL HEAT OF THE EARTH.

Dr. Julius Schavarez read a paper on this subject before the British Association, in which he concludes that the different corollaries of the central fire doctrine were not adequate to explain the different groups of natural phenomena for the sake of which these corollaries were deemed essential fifty years ago. He adds some suggestions as to how experiments should be made, in order to ascertain the temperature of the earth at different depths, simultaneously in different quarters of the globe. Sir Charles Lyell said he was glad to know that the subject of underground temperature was to be taken up at the expense of the British Association. He had long been convinced that so far as the evidence now goes, there is an increase of temperature very generally as we descend from the surface of the earth as far into the interior as we can enter, but it is a mistake to suppose that the best observations indicate a uniform increase. That he believed, would be one of the results of the inquiry, but it would also be a great point to ascertain what was the amount of difference of temperature at different places.

### A NEW ELECTRIC LIGHT.

An exhibition of the working of a new method for producing light by means of electricity, the invention of Prof. Nollet of Paris, was made at the Battery in New York, on the 15th inst. The illuminating apparatus having been placed on the roof of the Barge office, threw a very clear and penetrating light to a great distance. So strong was the light, that the captain of one of the revenue cutters informed the company that he had read his newspaper by it at the distance of nearly six miles, and at the Narrows the ordinary gaslight displayed from the tower of the Barge office was entirely lost sight of in the greater brilliancy of its new rival. The apparatus for producing electricity is quite simple, consisting of several series of horse-shoe magnets—fifty-six magnets in all—arranged in a cylindrical form in a frame, within which is a revolving cylinder thickly set with bobbins of soft wire, which, by the motion of the cylinder, are made to pass very rapidly between the poles of the magnets. The action of the magnets on these revolving points generates a large amount of electricity, which is carried through a conducting wire to the point where the illuminating apparatus is placed, and thence back to the generator. At the illuminating point the circuit is broken, and the two ends of the wire are tipped with pencils formed of the resinous substance which collects in the retorts of gas works. These points become intensely heated by the passage of the current, and give out an intense white light. As the points burn off, these carbon pencils are fed up by clock work, so as to preserve a uniform distance between them. The expense of producing the light, exclusive of the cost of the power required to drive the generating machine, is said to be about two cents per hour. In this case, the generator was driven by a small Andrews oscillating engine, of about eight horse power, three of which was ample for the purpose. The same generating apparatus may be used to supply separate currents to several lighthouses at the same time, if in the same neighborhood, as the electricity can be conducted, through wires, several miles.

## *NEW METHOD OF COMBUSTION.*

After the reading of scientific news items, Mr. Calvin Pepper took the stand, and explained his improved stove, and his method of combustion. In the illustration of his stove, the top was composed of a sheet of iron which was perforated with minute holes. No lower draught is required, as the air necessary to support combustion, is fed through this perforated metal, and comes to the fire in minutely divided streams, and in the exact quantity to afford complete combustion. He claimed for his plan a saving of fuel, and that in the kitchen stove the process of cooking can be accomplished by radiated heat, above the perforated plate. He asserted that he could broil a beefsteak in this way in five minutes, and this fact drew out considerable discussion.

Mr. Pepper also detailed at some length his peculiar method of burning petroleum in steam boilers. He uses a reservoir of sand which is saturated with oil, and upon water being fed into an outer vessel, and introduced among the sand, by the specific gravity of the water, the oil is kept on the top. The oxygen, from the decomposition of the water, materially assists the combustion, and he made the assertion that he had succeeded in burning water. He produced a model of his invention, and would have performed the experiment, but the lateness of the hour prohibited it.

## *PLOWING BY STEAM.*

Mr. Blanchard described his theory of a steam plow. He thought it impracticable to draw the plows after a traction engine, and proposed to use double plows drawn back and forth across the field with a portable engine.

Some discussion ensued relative to its practicability, and it was asserted that steam plowing as at present employed, would not pay in America.

Dr. Bradley asserted that the method of plowing with horses had no equal.

Prof. Tillman remarked that steam plowing did pay, and that in India more steam plows were employed than in the whole of England. The plows were all drawn by stationary steam engines which communicate their power by means of wire ropes.

Mr. Reid declared that the American farmer needed a plow which would be drawn in rear of the motor. The packing of the ground, if that was an objection, could be obviated by a proper cylinder, and he then explained a method of overcoming obstructions where such a cylinder was used. By means of a gear attached to an arm and working in a circular rack upon the interior periphery of this advancing drum, an obstruction which would prevent the drum from advancing, would enable this gear to travel up the toothed rack, and the weight of the gear and its attachments would, when it had traveled a sufficient height, materially tend to the forward rotation of the cylinder.

Dr. Parmelee suggested that during the ensuing week, the Chairman appoint a committee of five, who should confer together for the purpose of devising the best method for testing the power and efficiency of steam engines. After some discussion it was voted that such a programme be carried out.

### NEW FIBER.

Mr. Hoffman presented a mass of long fibers from the leaves of a plant which grows in Nicaraugua. These fibers resemble hemp, but are lighter colored, and said to be much stronger than that material. He stated that it could be reduced to the state of fiber from the green leaf, and that the natives would collect it at the wages of forty cents per day. The plant is plenteous, and grows spontaneously. It undoubtedly belongs to the Agave family.

Adjourned.

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## October 31, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Esq., Secretary.

The Chairman presented the following notes on novelties in science and art:

### PETROLEUM IN CHINA.

An oil-bearing stratum, three hundred miles square, yielding petroleum of a superior quality, has been discovered not far from Pekin, China.

### LITHIA.

The celebrated spring on the Gettysburg battle-field contains the oxide of lithium (*lithemat*). The same alkali is found in small quantity in some of the famous mineral springs of France and Germany.

### WINE CONTAINING ZINC.

Dr. Wittstein has recently found that European wines may contain zinc, in the form of salts, and that its presence is due to the fact that the isinglass used in purifying the wine was adulterated with about two and a half per cent of the oxide of zinc (*zinamat*). Isinglass of this description is not transparent, but opaque.

### ANATOMICAL PREPARATIONS.

Glycerine has been found to be a valuable ingredient in preventing putrefaction. The subject to be preserved is immersed in a mixture of fourteen parts of glycerine, two parts of brown sugar, and one part of nitrate of potash, until a slight deposit begins to be formed in the bottom of the vessel. When removed from the solution, the muscles and articulations are perfectly rigid, but they will recover their pliancy after exposure to warm, dry air.

### CHERRY STONING MACHINE.

Mr. Gruelin, a German, has invented a machine for removing the stones from cherries. It consists of a horizontal revolving wheel, in the periphery of which are a series of cavities, each large enough to hold one cherry. By the revolution of the wheel each cherry is brought under a vertical rod, which by a sudden depression forces out the stone and pushes it through a hole in the bottom of the cavity, and then by means of a spring returns to its original position, when it is ready for a descent upon the next cherry. The fruit is fed into the wheel by means of a shoot. It is said the machine will remove one hundred stones per minute.

### CAUSE OF THE SILKWORM DISEASE.

Some years ago Baron Von Liebig expressed the opinion that incomplete nutrition might be the cause of disease in the European silkworm, and that the aliment offered them in the mulberry leaf might not be sufficient for the formation of the cocoon. Recent analysis of the mulberry leaves of France and Italy have confirmed this opinion; it having been thus demonstrated that these leaves contain a smaller amount of phosphates and nitrogenous substances than those of the mulberry trees of China and Japan.

### TESTING GLYCERINE.

The effect of glycerine (*echarlilt*) on tender and broken skin should be mild, but physicians often hear complaints of its burning and inflammatory action, even when it has been largely diluted with water. The effect of such a glycerine is now known to be due to the presence of a certain amount of oxalates and formates, also traces of ammonia. Litmus paper will remain unchanged in such impure glycerine; but when the latter is mixed in a test-tube with its equal bulk of sulphuric acid, a strong effervescence will take place. It has also been ascertained that such glycerine was not obtained by the process of distillation, but was only partially purified by chemical action.

### LUCIMETER.

This instrument, for measuring the quality of burning oils by their illuminating power, invented by Mr. Deslauriers, consists of two constant pressure lamps and a photometer, constructed on a new principle. Its shape is triangular; it is made of sheet iron painted black, and is divided into two equal compartments. The latter are turned toward the lamps, while the observer stands on the opposite side, which presents nothing but a flat vertical surface, pierced with a hole, bisected by the partition. Each of the two lamps is so placed so as to transmit its light to only one compartment, and exactly to the part where the hole is. The hole is covered with a piece of transparent paper, on which the light from the two lamps is contiguously depicted. If their intensity is the same, the observer will perceive no difference. If not the same, one lamp must be moved back until its light is equal to the other in intensity, and the difference in the distance of the two lamps will make the relative quality of the two oils, which, combined with the quality consumed in a given time, will determine their marketable value.

### ANIMAL ELECTRICITY.

Mr. Schultz Shultzenstein has lately published his investigations of the relation of electricity to muscular action. His novel and startling conclusions have been thus formulated:

1. The supposition that living muscle produces electricity is incorrect. If needles be plunged into the foot of a living animal, and be placed in connection with a galvanometer, no deflection of the galvanometer needle occurs.

2. Muscles removed from the body give evidence of electricity, but this is because of the combination of the decomposing tissue with the oxygen of the air.

3. Salt water causes the galvanometer needle to be deflected. This explains why salted meat gives evidence of electricity.

4. The supposed electric current in the human muscle is solely caused by the salt water in contact with the tissue.

5. In diseased structures the electric current is derived from the decomposing tissues.

6. The electricity of the secretions is also derived from the decomposing tissues.

7. Animal electricity is an illusion.

The author has requested the French Academy of Sciences to appoint a commission to witness and report on the experiments upon which his conclusions are based.

### MUSHROOMS IN THE EAR.

Dr. C. Robin, in a paper addressed to the French Academy of Sciences, described two new kinds of mushrooms, of the *aspergillus* genus, growing on the membranes of the tympanum. This parasitical vegetation he had observed in ten patients, four of whom had it in both ears; and in all cases it existed independently of any other morbid affection. Each of these auricular mushrooms presents the chief botanical characteristics of *aspergillus glaucus*, but they differ in the color of their organs of fructification. They form a pseudo-membrane, covering that of the tympanum, so that if the former be extracted entire, it will be found to have the exact shape of the latter. Dr. Robin wished to see whether these aspergilli could exist elsewhere than on the human body; he therefore tried several kinds of fruit, and found that they took to the lemon and orange very readily, but on the transfer they lost the color exhibited while on an animal soil. The growth of these parasites in the human ear is an obstinate malady, for which Dr. Robin prescribes highly diluted solutions of hydro-chloride of lime or of arsenite of potash, which at once destroy the cells of the aspergillus. Phenylic and tannic acids do not destroy the cells, but mummify the pseudo-membrane in a remarkable manner.

### FRUITS OUT OF SEASON—PRESERVING, OR RETARDING HOUSES.

The house erected by Prof. B. W. Nyce, in Cleveland, some four years ago, has been so minutely described, that we will not go into the particulars of one recently built in this city. The thing, so far, has been kept very quiet, few persons passing the iron building corner of Thirty-eighth street and Tenth avenue, having any idea of its use. It was hastily erected last July, under the supervision of that well-known pomologist, Wm. S. Carpenter, of this city, who is associated with Prof. Nyce in its ownership. The building is 38x48 feet, 23 feet in height, with the outside of corrugated iron, the edges or lappings being air-tight. Three feet from the outer wall is an inner one, of smooth iron plates, also tight, the space between them being filled with pine wood turnings. The floor is of iron, also tight, and thirteen feet above is a water-tight galvanized roof, or ceiling, which is the bottom of a capacious ice-box. The space thus inclosed is the fruit-room, to be divided off into as many air-tight compartments as desired. In the present house there is a hall running through the center, and four rooms upon each side, the partitions also being of iron. These rooms are again divided, making sixteen small rooms in all, each capable of holding eighty-four barrels of fruit, making the capacity of the house 1,344 barrels when put in bins, or about 1,500 barrels closely stored in the barrels themselves. All of the doors are so lined or packed with flannel as to make them very tight, and each room is approached from the hall through a closely packed door. The hall itself is reached through double doors, one of which is closed before the other is opened. These precautions show why a uniform temperature of 33 to 34 degrees is maintained within the fruit-rooms. A preparation is kept upon the floor to absorb the moisture, so that a perfectly dry atmosphere is maintained. The refrigerator or ice-box over this room is very simple and effective. The bottom is composed of riveted galvanized iron, made water-tight, and sloping a little to carry off the water. Then matched boards, three feet from the outer iron walls, form the sides of the ice-chest, which extends entirely over the inclosed rooms below. The space between the boards and the sides of the room is filled in with the wood turnings, and, after putting in about two feet in thickness of ice, or twenty-five tons, boards are laid over, and twelve to fifteen inches of the turnings spread over them. There is quite an open space over this, kept well ventilated. So perfect is this ice-house, that it had settled only three inches in a month. It is contemplated to fill it with a solid cake, six feet thick, next winter, by means of a hose and sprinkler, during extremely cold weather. It is estimated that such a cake will last two years.

Such, in brief, is the house, the object of which is to retard the ripening process of fruits, or prevent the decay or putrefaction of meats, poultry, vegetables, &c.; and the results so far fully sustain the expectation of its originators. It was in readiness when Bartlett pears began to come into market, and between three hundred and four hundred barrels of this fruit was put in, generally at a cost of eight to twelve dollars per barrel. They are going out at the rate of twenty barrels per day, at eighteen to thirty dollars per barrel, according to size, the Fifth Avenue Hotel taking two barrels per day. The largest specimens of selected fruit are sold to fancy fruit dealers at nine to ten dollars per hundred. About one hundred barrels of the finest Bartlett's were from that noted grower, Mr. T. C. Yeomans, of Wayne county, N. Y., who is also furnishing extra fine Duchesse pears from his orchards. One hundred barrels Virgalleus are coming from Rochester, which go into the chambers of this house. The fruit now coming out is in a good state of preservation, green and firm, looking as though it was good for another month, but the prices are too tempting to hold on to it. Some barrels are to be kept for several weeks yet. As they come out, Louise Bonne, Duchesse, Seckel, and other later pears go in; they in turn to give way to Vicar of Winkfield, Glout

Morceau, and Winter Nelis. Some Washington pears, put in in August, the season of their ripening, are still firm and fresh, with apparently as brisk and lively a flavor as ever. Beside the pears, are twenty-five crates of peaches, also put in in August, and still sound. We might remark that when a room is opened for removing the fruit, though it is still as green as when put in, it soon begins to color by the admission of air, and will not keep for a long time after removal. It is therefore important that no overripe fruit goes into the houses. The chief success is in retarding the ripening, rather than in preventing decay. One of the rooms is devoted to grapes, and now contains a ton and a half of foreign sorts, mostly choice Black Hamburg's; also, half a ton Delawares, with a large quantity of Rebeccas. The house at Cleveland, of which this is a branch, is being filled with thirty tons of Isabella, Catawba and Delaware grapes, which are to be sent here for sale in December, January and February, when the house is to be filled with some three thousand barrels of apples—that building being 45x75 feet, and capable of holding this amount.

In accordance with a resolution passed at a previous meeting, the Chairman appointed a committee to investigate and report upon the best method for testing the power of engines, consisting of Messrs. D. D. Parmelee, J. B. Root, Warren Rowell, W. P. Trowbridge, Charles E. Emery, Hamilton E. Towle, T. D. Stetson, Geo. Peyton, S. H. Maynard, and Dr. Vanderweyde.

## *BENZOIC ACID.*

Dr. Adolph Ott then took the stand, and read a paper upon the production of benzoic acid from naphthalin. After describing the appearance of this acid as it is extracted from benzoin, tolu balsam, and some other substances, the doctor stated that it could be quite cheaply produced from the products of the gas works, and described the following process by which hydro-carbons are changed into benzoic acid: The naphthalin is transformed into a modification of the bi-protochloride of naphtha, this by oxydation is converted into phtalic acid of ammonia; this is subjected to distillation, and by the action of lime changed into benzonitril. By boiling the latter with a caustic solution of soda, benzoate of soda is formed, from which the benzoic acid is precipitated by hydrochloric acid. This was announced as the process of Castelhar, and has been pronounced by the Secretary of the Chemical Commission of the Paris

Exhibition to be one of the most important discoveries made in technical chemistry since the London Exhibition of 1862.

## *NEW GAS STOVE.*

Mr. Lazear exhibited a dome gas stove, which differed from other stoves of this character, inasmuch as the perforated plate is so situated that it cannot be obstructed by dirt or injured by accident, and so arranged as to make the dome-burner self-cleaning. An air tube through the center of the burner serves to permit any foreign substance to drop through and not obstruct combustion, and an upward current of air secures a strong and steady flame. unaccompanied with odor or smoke.

## *NEW STEAM GAUGE.*

Mr. Botticher exhibited his patent adjustable pressure and vacuum gauge, and explained its construction. An adjusting screw seemed to be its chief improvement. As it was a mercurial gauge, some objections were raised by the members to the employment of gauges of this class. Mr. Fisher remarked that he had at one time held a gauge of this class in his hand, and in a few moments it indicated three pounds pressure, and this from the heat of his hand alone. It was claimed by the inventor that the objections to mercurial gauges are entirely removed in his adaptation.

## *THE HINKLEY KNITTING MACHINE.*

Mr. G. E. Harding, of 726 Broadway, New York city, exhibited the new Hinkley knitting machine, and stated that at first, like the sewing machine, the knitting machine was introduced only into manufactories, but is now considered as essential in a family as the former. While other machines knit with from seventy-five to one hundred and fifty needles, this machine uses but one needle, which is threaded similar to a sewing machine needle, and is as easily managed. In fact, a child of twelve yeaes of age can run it. It operates by hand or foot, like a sewing machine, knits hosiery with the heel and toe complete, will knit flat work of all descriptions, and can be operated at the rate of two thousand stitches per minute. Although a new candidate for favor, the machine has received one of the highest premiums at the late American Institute Fair; and one of the advantages claimed for it, in addition to its simplicity, is that it cannot be rendered valueless for a time, as other machines of this character often are, by the breakage of a number of delicate needles.

### *CARPET-STRETCHER AND TACK-DRIVER.*

Mr. Harding also exhibited Brown's combined carpet-stretcher and tack-driver. This simple implement was much admired by the audience, who seemed to appreciate its usefulness, and the ease with which any person, even a lady, and with no other assistance, can stretch and tack a carpet with little or no fatigue. (For description and illustration the reader is referred to page 245 of the present volume of the *American Artisan.*) Mr. Harding is sole agent for the sale of this implement for the New England States. The same gentleman also exhibited a tack-extractor, which accompanies the tack-driver, and by which the tacks can be extracted from the floor as easily, and with the same celerity, as they are driven.

### *NEW WINDOW SHADE.*

Mr. Grice exhibited an improved window curtain fixture, which is so arranged that the curtain will remain at any position, and will roll up even. The principle is a combination of rolls, which confine the curtain and hold it in its position.

### *PREPARED EGG.*

Mr. Boole exhibited some fresh compressed egg, made up in the form of large wafers. These are not a substitute for egg, but are the egg itself, with the aqueous portion extracted and then compressed. It is intended to be used precisely as fresh eggs are.

### *NEW GEARING.*

Dr. Warren Rowell, of New York city, exhibited his patent cog-wheels. These wheels are formed with either five or seven teeth, and are applicable to any mechanism where the working point or pitch-line between the two wheels is to be often varied, as in rolling-mills, etc. The wheels exhibited were designed for wringer-rolls, and were composed of step-gears, with a ring between them. The claims of superiority over other gears are the ring between the steps, giving strength, reducing the number of teeth, and increasing the pitch, and by placing the teeth of one set opposite the spaces of another, thus making the motion continuous. Many questions were asked respecting the gearing, and much curiosity seemed to be elicited by its novelty.

It was proposed that the subject of novelties at the fair be continued at the next meeting, and the Association adjourned for one week.

## November 7, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Esq., Secretary.

The Chairman read the following notes on applied science:

### JASPER.

This mineral is now procured to almost any required extent at St. Gervaise, Savoy, where a quarry has a depth of sixty-six feet, and a surface of at least twenty-four thousand square yards.

### KOOMISS.

Dr. Stahlberg, physician to the factories of Sorga, in the Oural, read a paper before the French Academy of Medicine, on the efficacy of koomiss, or fermented mare's milk, in the treatment of pulmonary diseases. Its use is said to lessen the secretion of the mucous membranes, and afford better nourishment. The Khirgheses prepare the best kinds of this beverage, and administer it with success to those who have a tendency to consumption.

### PENDENCY OF THE EPIGLOTTIS.

Sir Duncan Gibb stated, in a paper read before the British Association, that about eleven per cent of the Europeans examined by him, had the epiglottis hanging down over the windpipe, instead of erect, thus retarding respiration and preventing clearness in singing and speaking. He had also examined nearly three hundred Asiatics, and both males and females had a more or less pendent epiglottis, which would account for the fact that none were fine singers.

### NEW MIXTURE FOR MATCHES.

Prof. Böttger has found that a mixture of eight parts of teroxide of thallium and one part of penta sulphide of antimony (commonly called golden sulphuret), has the property of igniting by friction. A mixture of teroxide of thallium and powdered sulphur ignites with a sharp explosion when struck. The picrate of thallium may be exploded in the same manner. However, the scarcity of thallium will prevent any use of these compounds for commercial purposes.

### THE LAW OF DIFFUSION.

One of Herr Merz's methods of exhibiting the phenomena of diffusion is, to remove a portion of the shell of an egg, by means of hydrochloric acid solution (*thalad*), so as to leave the membrane exposed, and to suspend the egg in water from the arm of a balance, the opposite arm being counterpoised. In about a half an hour the position of the balance will show that the egg has increased in weight, in consequence of the passage of water through the membrane. On substituting alcohol for the water surrounding this egg, and adding weight sufficient to bring the arms to the same level, after a short time the egg will begin to rise, thus proving that it has become lighter in consequence of the passage of the water from the egg into the alcohol.

### A NEW REAGENT.

Prof. Bõttger has prepared a new and highly sensitive chemical test for acids and alkalis, from the leaves of an ornamental plant named, in honor of the Dutch horticulturist Verschaffelt, *Coleus Verschaffelti.* The reagent is prepared by digesting the fully developed leaves in alcohol, and impregnating slips of Swedish filter-paper with the decoction. This test-paper differs from litmus —prepared from a certain species of lichen—in having a beautiful red tint, which becomes green under the influence of an alkali or alkaline earth. It is not affected by free carbonic acid (*garet*), so that it may be used in detecting traces of carbonate of lime (*calcmasot*) in water. A strip of this paper moistened in water and held over a burner from which gas is issuing, assumes in a very short time a green tinge, in consequence of the ammonia, from which, perhaps, no gas is altogether free.

### LUMINOSITY OF PHOSPHORUS.

Dr. Moffat described before the British Association, several interesting experiments he had made. Phosphorus in a luminous state produces phosphorous and phosphoric acids, also ozone. Phosphorus is non-luminous below the temperature of 39° F., and is luminous above 45° F., but the point of luminosity varies with the pressure of the atmosphere and with the direction of the wind. Experiments extending over a period of four years had proved that the equatorial or sea-wind produces phosphoresence and ozone; and that the polar or land-wind has no such effect. As the ocean is the great resorvoir of ozone, Dr. Moffat concludes that the latter is developed by the phosphorescence of the ocean, and that were it not for the modifying influence of the polar winds, ozone at sea would be a constant quantity.

### ANEMOMETER.

Mr. A. E. Fletcher exhibited at the British Association his instrument for measuring the speed of air in flues and chimneys. It is constructed on the principle first fully illustrated by Thomas Ewbank of New York, which was many years after applied by Giffard of France, in the construction of his injector, viz: that the rapid current of a fluid draws in the same direction any other fluid in contact with it. Mr. Fletcher places in the flue a straight tube in direction of the current of air, and in connection with it a tube bent, so as to face the current; both are connected with a column of ether, and the difference in the pressure in each will be indicated by the height of the ether in the graduated column, which measures the force of the current in the flue. The same instrument, with a slight modification, may be used as a wind gauge.

### PYROTECHNICAL.

M. Pool makes a fast or slow burning powder by substituting common glue for charcoal in the ordinary process. He soaks his glue or gelatine in cold water, then heats it with nitric acid, and after evaporating the solution to dryness, he re-dissolves it in hot water, and adds sufficient carbonate of baryta (*barmarit*) to neutralize the nitric acid. The solution is evaporated again, and two parts of sulphur and six of nitrate of potash (*kalmarit*) are added as the evaporation proceeds. By varying this process, he also makes a slow burning powder. His compound for producing red fire consists of five parts of glue, treated as above described, with seven parts of saltpeter and five of chlorate of potash (*kalemedeet*); to these is added a mixture of three parts of nitrate of strontia (*stronmeneat*), with one of charcoal. The *Mechanics' Magazine* says the chief merit of this compound is its non-liability to spontaneous ignition.

### PROTECTION OF STONE BUILDINGS.

Mr. J. Spiller read a paper at the last meeting of the British Association, in which he showed that the sulphurous and sulphuric acids in the atmosphere, and resulting from the burning of coal fuel—the best of which, as well as the coke, must contain at least one per cent of sulphur—acts in a very destructive manner upon dolomite and the numerous class of limestones commonly employed in the public buildings. As a remedy for the decay of stone, he proposes to apply to its cleaned surface an aqueous solution of the superphosphate of lime, which should not contain any appreciable amount of sulphuric acid; the specific gravity of the solution when ready for use should be about 1. 1. One gallon will cover about three hundred superficial feet, when two coatings are applied to

Caen or Portland stone. This solution by forming crystalized diphosphate of lime, has the effect of hardening the surface of the stone, and diminishing its capacity for absorbing water.

### TOPOGRAPHICAL INDICATOR.

Mr. Bazalgette described before the British Asssociation at Dundee, his plan for supplying trustworthy topographical information to all classes of tourists. On reaching summits in England, commanding extensive views, there seems to be difficulty in obtaining trustworthy local information regarding objects brought within the field of the telescope. He proposed to supply such information by means of a local indicator, consisting of a circular table of stone or metal, engraved with radial lines pointing in the direction of any object of interest. Upon the line would be engraved the name of the object, its distance from the point of view, and, in the case of mountains, their height above the sea. A table three feet in diameter, would be sufficient to embrace a district of thirty miles. To facilitate reference, concentric lines representing distances of five miles would be engraved; and beyond the outer circle, might be placed maps of cities, cathedrals, &c., beyond the distance of thirty miles. In the center of this table is to be placed the telescope, and the whole is to be covered by a light ornamental building so arranged as not to obstruct the view.

### *GIFFARD'S INJECTOR.*

Mr. J. K. Fisher illustrated upon the blackboard, his proposed improvements on the apparatus for supplying a steam boiler with water, by means of steam from the boiler itself. The steam current carries particles of cold water with it, and being itself condensed, its momentum is sufficient to carry the water into the boiler.

Considerable discussion followed on the value of any injector on Giffard's plan. The chairman said the injector was not in all cases reliable, for the temperature of the water to be forced in, had an important part to play in this mechanical paradox. The injector is useful where water is to be forced into a boiler while the engine attached to it is not in operation, and the pump which ordinarily supplies the boiler is consequently motionless.

### *THE BRIDGEPORT KNITTING MACHINE.*

This machine, manufactured at Bridgeport, Conn., was exhibited and operated before the meeting.

The great advantage which the Bridgeport knitting machine has over any other is, that it is operated with a treadle, in the same manner as a sewing machine, and with the same ease, leaving the hands of the operator free to attend to the knitting. It will reel and spool the yarn while knitting, if desired; thus no time is lost in preparing the material. It will knit a flat web from one-fourth of an inch to seventeen inches wide, with a selvedge edge.

It will knit a stocking in about the same time usually occupied by a person winding a skein of yarn by hand. A stocking knit by this machine is narrowed after the same rule as that used by our grandmothers, and the toe is closed in the same way.

It is the only machine that can knit a stocking as complete as by hand from top to toe, including a perfect heel, without taking the stocking from the machine, and will knit any form, size or shape required. Also, wrappers, drawers, and all articles knit by machinery.

It will knit woolen and cotton yarn (fine or coarse, home or machine-spun), without any exception; also, worsteds of all kinds, silk and linen thread.

Any knots or imperfections in the yarn can be knit in without breaking the needles, leaving the same on the wrong side of the fabric. If a stitch should, by accident or carelessness of the operator, be dropped, it is easily picked up, in the same manner as done when knitting by hand, and it is impossible to tell where it was omitted.

For elasticity, durablity and smoothness of fabric, it is far superior to hand knitting, and the working of the machine is so simple that it can be used with perfect ease by a child of twelve years.

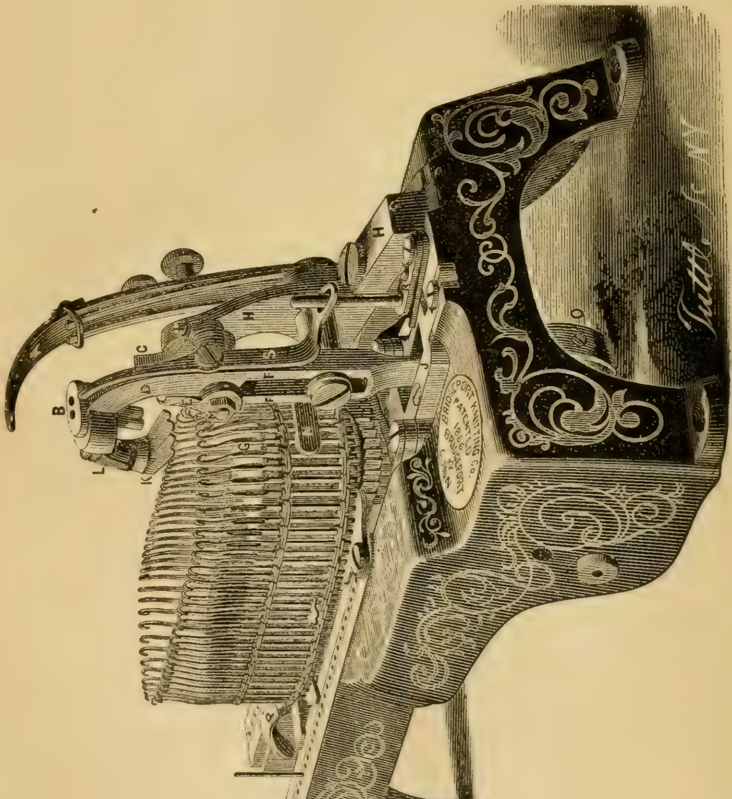
It will compare favorably with the best sewing machine for simplicity, durability and style of finish.

Every machine is thoroughly tested and inspected by a practical machinist and knitter, before it is permitted to leave the factory.

The following is a description of the machine, reference being had to the accompanying illustration:

*A* represents the tension of the machine, through which the yarn passes when knitting. It is regulated by screws on the side. To knit tight, turn them toward the operator, and to knit loose, turn them from you. The holes nearest the operator are used when knitting with a single yarn.

*B* is called the yarn tubes. They pass the yarn around the needles, thus forming the stitch or loop required for knitting. The tube nearest the tension is used when knitting with a single yarn.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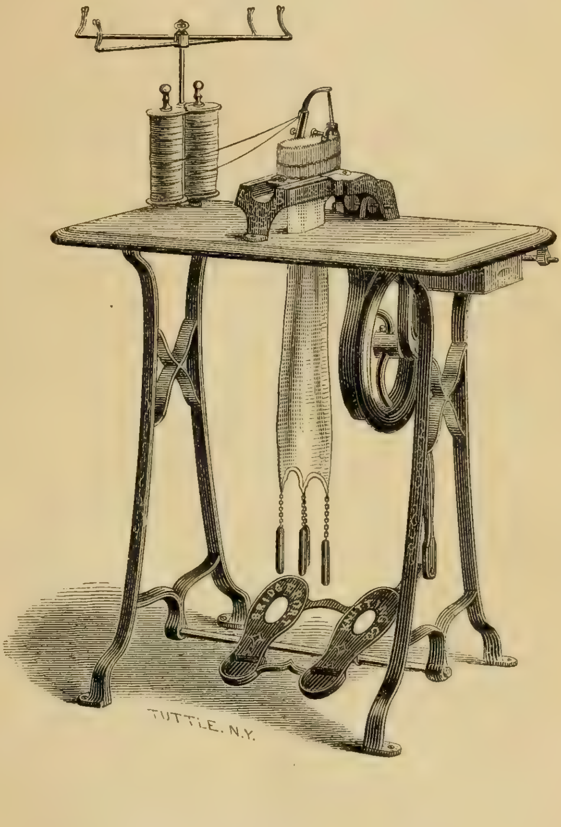
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*C* is the picker cam, by which the pickers *E* are kept in proper position. It is adjusted by a screw, and when it is loosened, the picker can be raised or dropped at pleasure.

*D* is the picker bar, which gives all the necessary motions, and supports all the necessary attachments for knitting the yarn on to the needles.

*E* is called the picker, and by the motion of the picker bar, it is made to pass into the groove of the needle, and catch the loop made by the yarn tube, carrying the same over the hook of the needle, thus forming a new stitch.

*F* is the face of the picker bar, and it should be in a direct line with the front tooth of the cylinder *G*.

*G* is the cylinder which brings the needles in a position before the picker for taking the stitch. It will revolve either to the right or left at the pleasure of the operator.

*H* is the stand which holds and guides the picker bar.

*J* is the feed bar, which gives the motion to the cylinder, and is connected to the main cam by a cam strap; said cam moves both the feed and picker bar.

*K* is the presser, which presses the loop formed by the yarn tube over the groove of the needle, so that it can be catched by the picker.

*L* is the presser spring.

*M* is the nut for securing the pickers, and must be loosened when you wish to turn down the extra picker; the inside picker only is down when using a single yarn.

*N* is a spring for holding the needles firmly in the teeth of the cylinder while the stitch is taken.

*O* is the place where the cam strap can be reached when it is necessary to adjust it, there being a screw on the bottom of the strap to tighten or loosen the same.

*P* is a cam to the chain slide. It is pressed down when you wish to loosen the chain of needles, and pulled up when you wish to tighten them. This chain slide is moved forward or back, and the needles are hooked together in pairs. Thus, we can have any number of needles desired on the machine, also increase or diminish the size of fabric at pleasure.

*R* is a shipper, that is moved from the under side by a yarn shipper.

*S* is a lever, connecting the shipper *R* with the yarn tubes *B*. Thus the yarn shipper is enabled to change the direction of the yarn every time the direction of the needles are changed. Thus we are enabled to knit forward and back, and can knit a complete and firm heel better than any machine now offered to the public.

### *CORN HARVESTER.*

A model of Butterworth's corn harvester was then exhibited and explained. It is propelled by a single horse, who walks between two rows of corn, and these rows are gathered by the machine, cut by attached blades which are fixed at angles near each wheel; the corn when gathered is dropped in bundles which may be varied at pleasure. Twelve to fifteen acres of corn per day can be gathered by one of these machines. This machine was invented by T. Butterworth, of Quincy, Ill., and patented on February 6, 1866.

### *BILGE-WATER INDICATOR.*

Brevoor's improvement on Shaler's bilge-water indicator was then shown. It consists of a small dial, having an indicator hand attached, and operated by a gear and flexible valve behind the dial. A tube leads from this valve into the hold of the vessel. As soon as the end of the tube comes in contact with water, the air contained in the tube is compressed, and acting on the valve, is indicated by the hand upon the dial.

Mr. Walling showed some small metallic caps or covers which had their flanges split in small sections, and inquired the cause. As these caps were formed by spinning, and then electro-plated, it was suggested that the evil was done in the act of turning the edge when being spun by the workman, but not made visible until electro-plated and polished.

After some discussion, the meeting adjourned for one week.

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## November 14, 1867.

Prof. S. D. TILLMAN in the chair; J. WYATT REID, Esq., Secretary.

The Chairman read the following notes on scientific progress:

### MASTIC CEMENTS.

According to Bottger, these cements are mixtures of 100 parts of sand, limestone, and litharge (yellow protoxide of lead), with seven parts of linseed oil. At first the mixture has little coherence, but when pressed it gradually acquires the hardness of ordinary sandstone.

### MISSOURI TIN.

Dr. T. R. Goulding, of St. Louis, has been experimenting with the tin ores of Missouri, for the purpose of determining the best process of reducing them. On the 18th ult., he produced the first pig of pure tin ever made in America. Its weight was eight per cent of the weight of the ore used in its manufacture.

### PREPARATION OF TARTARIC ACID.

Messrs. Juette and Ponteves, of France, have prepared tartaric acid from the pressed grape skin, which is a waste product in the manufacture of wine and brandy. After treating the skins with water and obtaining lees, two per cent of sulphuric acid is added, and the mixture is boiled until the tartaric acid in combination is set at liberty. The action of the acid on the cellulose of the pulp forms a small quantity of glucose. The liquor, after fermentation, is treated with a solution of lime and the tartrate of lime is formed, which, on being subjected to concentrated sulphuric acid, yields sulphate of lime and free tartaric acid.

### CROUP CURED BY SULPHUR.

The *Medical Gazette of Paris*, states that M. Langanterie, of Paris, after observing the effect of sulphur on the oidium of grape vines, was led to administer it in several cases of croup. He mixes a teaspoonful of sulphur in a glass of water, and gives a teaspoonful of this mixture every hour. The effect is described as wonderful. The disease is cured in two days, the only symptom remaining being a cough arising from the presence of loose pieces of false membrane in the trachea. M. Langanterie says he has followed this plan in seven cases, all being severe, especially the last, in which the child was cyanotic, with protruded rolling eyes and noisy respiration.

### AMALGAMATION OF GOLD.

*The London Mining Journal* states that cyanide of potassium has been found to answer the same purpose as sodium in combination with mercury for the purpose of extracting gold. Mr. Wurtz, of New York, first made use of sodium amalgam, with which very good results have been obtained in our gold-bearing districts. It is now claimed that cyanide of potassium has been successfully used on copper plates and in the pans. The surface of the plates, after being cleaned with sand and nitric acid, and well washed in cold water, are covered with the cyanide solution; the mercury is applied immediately and well rubbed on; the result is a highly sensitive coating of mercury which will seize any particles of gold passing over it. In the pans the cyanide is applied with each charge of mercury.

### A NEW TELEGRAPHIC THERMOMETER.

Prof. Wheatstone has devised a new thermometer, which by breaking and closing an electric current will convey its record to distant places. The same principle is applicable to the whole class of meteorological instruments. The telegraphic thermometer consists essentially of two parts. The first is the magnetic motor, constructed on a plan similar to that used by the inventor in his alphabetical magnetic telegraph, and is so arranged that by turning a handle the lever at the other extremity of the line will describe, by regular steps, a complete circle. The second part consists of a metallic thermometer, in which the unequal expansion of two different metals is made to move a lever or pin around a graduated circle, which marks the degrees of temperature. The two parts are in such proximity that the telegraphic lever in passing around the circle must, at some point, come in contact with the pin, which is moved by means of the expanding or contracting metals. This contact breaks one circuit and completes another, and thus transmits to the other extremity of the telegraphic line information of the particular degree of heat at that instant indicated by the thermometer. The uses to which this telegraphic thermometer may be applied are, among others, the following: The thermometer may be placed on a high mountain, and in a place not easily accessible; for instance, on the highest point of Mount Blanc, and in the valley of Chamouni, may be fixed the battery and terminal wires, at which point the interrogator may, from time to time, ascertain the temperature at the top of the mountain. In the same manner reports of temperature may be obtained from any point beneath the surface of the earth at which the thermometer is located. This thermometer is not self-recording; it responds only when questioned by the operator of the telegraph.

### TEST FOR FIXED AND VOLATILE OILS.

Mr. Bruce Warner read, before the British Association, a paper "on the electrical resistances of the fixed and volatile oils," in which he shows that difference of resistance will indicate the purity of the oil under examination. The process is founded on the discovery made many years ago by M. Rousseau, of France, that olive oil—the feeblest conductor of electricity—when mixed with one hundredth of its volume of oil of poppies increased the number of vibrations of a magnetic needle in a given time, when the same was included or made to form a part of a voltaic current. He gives a table of resistances of volatile and fixed oils, and remarks that the adulterants of volatile oils are principally turpentine and alcohol. Compared with any of the essential oils, turpentine has an immense resistance, while that of alcohol is enormously lower than any of them, except, perhaps, that of the oil of bitter almonds, which was so low that he did not measure it in any of his experiments. The importance of this general fact is at once apparent, since the addition either of alcohol or turpentine in the smallest quantity is readily detected; and the quantity is denoted by the variation in the deflector, either when compared with a standard of known purity or by the resistances themselves. The oils of lemon and bergamot, when mixed with a small proportion of turpentine, do not, however, show such marked differences as the generality of essential oils. The effects produced by mixing different specimens of the same oil together are also perceptible; thus the German oils of peppermint or foreign samples of lavender oil produce modifications on the electrolysis. The resistances of the volatile oils were determined in these experiments by the use of one cell, but for testing fixed oils thirty-two cells were used. The author found that bleached fixed oils possessed a lower conducting power than unbleached oils, and the difference was very great in the case of olive oil. A singular difference existed between the Italian and East Indian castor oils, which was so wide that a very small percentage of one added to the other could be detected. Cotton-seed oil and oil of poppy, as well as turpentine, are so rapidly altered in their conducting power by electrolysis, that there is not the slightest difficulty in recognizing them in samples of oil. Olive oil, when free from-cotton seed oil or oil of poppy, has its resistance increased by electrification; but if the smallest quantity of either of them exists in a sample of olive oil, it produces a contrary effect, by a prolonged contact with the battery. The author of this paper has not, however, proposed any plan for testing oils which can be made of practical use in commercial transactions. The purity of oils cannot be ascertained readily by this or any other plan thus far proposed. An instrument for this purpose, adapted to the use of oil merchants, is now a great desideratum.

The items excited considerable discussion, in which Drs. Parmelee, Vanderweyde, Feuchtwanger, Mr. S. H. Maynard and others participated.

### RAIL COUPLING AND FASTENING.

Mr. T. Selleck, of Greenwich, Conn., gave the following explanation of his model:

This improved rail coupling and fastening was devised, after a careful study and examination of all the devices at present employed for coupling the abutting ends of railway rails, to remedy one of the greatest and most expensive evils attending the methods at present employed, namely, the lamination or battering of the ends of the rails in consequence of their resting on a rigid metallic chair. I found that a yielding bed was necesssary for the preservation of the rails, and also to give an easy motion to passing trains, and one constructed so as to allow for the free expansion and contraction of the rails. My invention accomplishes the object sought, and the fearful battering of the ends of the rails, caused by heavily-laden trains, is entirely obviated, and a free expansion and contraction of the rails is provided for.

I employ a metallic plate, having its edges turned upward in the form of lips, which rest against the flanges of the rails. This plate rests on two or more sleepers or ties, according to its length. The abutting ends of the rails meet at about midway of the length of this plate, and at a point between the sleepers. The plate rests snugly between sleepers at each of its ends against which they abut, and thus any longitudinal displacement of the plate is absolutely precluded. Strips of sheet metal, one or more, are placed on the plate, which serve as a cushion for the rails to rest upon, and thus prevent their being subjected to any material amount of concussion under the weight of the car wheels. This plate is prevented from moving laterally by ordinary spikes, which are fitted in notches in the sides of the plates, their heads projecting over the flanges of the rails. I employ three clamps for securely holding the rails upon the plate, and between its lips; the principal clamp being located in the center, and consisting of a wrought or rolled rectangular plate, whose ends are turned down upon the flanges of the rails, which clamp the plate and rail together so as to hold the rails at the joint securely against lateral displacement, and also in perfect line with each other. The end clamps are located at each end of the plates, and their edges are also turned down upon the flanges of the rails, and they clamp the plate and rails together at each end of the plates, the plate being cut away to prevent said end clamps being displaced. Spikes or screws passing through eyes or holes made in the flanges of the rails on each side, at about midway of their length, fasten the rails more securely and prevent the rails crawling, and these do not in any way interfere with the expansion and contraction thereof.

By my improved rail coupling and fastening, the rails are securely held in place without notching their ends or punching holes through their bodies, which is not only a destructive practice, but does not accomplish the purpose sought. The ends of the rails rest upon a bed, which permits them to yield just the same as does the rail at any other point between the ties, and is firm and secure in every respect, and prevents the rail being battered or laminated, at the same time providing a free chance for expansion and contraction. The rails are consequently kept in perfect line with each other; therefore cars, when passing over such a track, ride easily and without any abrupt jarring, or surging in rounding curves, and thereby a great saving is effected in the wear and tear of track and machinery.

There have been many attempts to accomplish the above object. For instance, strips of wood have been placed on each side of the rails against the necks thereof, at their joints, and bolted through them. Now, in a mile of rail the contraction is between five and six feet; it is therefore necessary to distribute the space as equally as possible between the ends of the rails. Where the rails are bolted together by appliances at their ends, as above stated, they tend to crawl and bring all the space caused by contraction at one place, especially on grades; but by my improvement each rail is bolted at its center to the ties, and hence the expansion and contraction is *from* the center to the end of *each and every rail.*

In brief, then, the object gained by my invention is to secure a uniform and easy motion to the trains, and to allow for expansion and contraction of the rails without their being destroyed, and to save in the wear and tear of track and machinery.

## KITCHEN BOILER.

Mr. Foot presented a wash boiler, patented by the Rev. Mr. Staple. It consists of an addition to the old boiler. It is a perforated false bottom from which two tubes arise, bent at end. The theory is, that as soon as the water is heated the steam will force the water through the tubes into the upper part containing the clothes, and thus with the aid of soap they are washed. No rubbing is needed. It is worthy of attention.

## *MULTIPLYING REFLECTOR.*

This apparatus, the invention of D. W. S. Rawson, of Peru, Illinois, enables a photographer to make from four to one hundred pictures at one exposure. The camera is not turned upon the sitter but upon a series of small mirrors, which throw the image of the sitter into the instrument. The mirrors are placed in a box about three inches deep, having a cover which may be closed when they are not in use. This box and the camera are placed on a board painted black. The camera receives light from the subject *via* the reflectors, at the smallest possible angle. The box contains fourteen reflectors, which is the number required for common work.

The advantages claimed over any multiplying camera, are:

1. The superiority of the work, as nearly every photographic gallery of the present day has at least one good camera tube, no trouble will be found in producing gems or small photographs of remarkable sharpness.

2. As only one exposure is required, the light is equal on every picture.

3. No extra camera-boxes, plate-holders, cut-offs, or apparatus of any kind to be bought or kept out of the way.

4. The expense is so trifling that the extra work of one week will pay for it in any gallery.

Mr. Carey Lea, of Philadelphia, had suggested in the *Philadelphia Photographer* for June, an improvement to this apparatus, which consists in arranging the mirrors to a surface having an ellipsoidal form so that the distance from the sitter to each little mirror added to the distance from the mirror to the lens should in each case be equal. The inventor has adopted the form proposed by Mr. Lea.

## *BORNEO—ITS CLIMATE AND RESOURCES.*

The Chairman next introduced to the audience Mr. J. W. Torrey, President of the American colony in the island of Borneo, who spoke for some time on the resources and condition of that country. The following is a meagre sketch of his remarks:

The President of the colony is Governor, and holds supreme power even to life and death. It has leased 16,000 square miles from the Sultan, for which it pays a yearly rent of $9,500. The island is 600 miles long, and England holds the only fee simple. The natives are an indolent set and cannot be taught, and will only work when compelled by necessity. There are many races on the island, and all have a different language. They resemble the Australians, and gradually depart as the white man advances.

There are five settlements of Europeans on the island. The American numbers seventy-five persons, eighteen of whom are Americans, and takes in the northern part. It contains no white lady. It was settled November 25th, 1865, and is called Eleanor. The settlement is named Kimanis. All the labor has to be drawn from China, who are ruled very strictly for fear of revolt, they being a very arrogant people. The natives are copper color. The climate is very healthy, a cool breeze blowing night and day all the year. The rainy season is during the S. W. monsoon. It is generally clear then until two o'clock, and then rains until midnight. A gale of wind has not visited the island for twenty-two years; prevailing winds are N. E. and S. W. There has never been a drought. Typhoid fever prevails to some extent. Mean temperature, eighty to eighty-three degrees. It is a very mountainous country, rising from the sea in three tiers, the third being called the backbone of the island. From this extends a large plain, on which the grass grows from six to seven feet high, and is always green. On the other side are the same arrangement of tiers. The interior is little known; trap rock prevails. He then showed some edible birds' nests, of which the natives make soup. They consist entirely of gluten, and are good for weak stomachs. They are made by a species of swallow from seaweed, by digestion. They build them on the sides of caves, a sort of concave shelf. The nests are tasteless and colorless. He also showed some coal, but it is not much used. Some antimony ore, taken from the surface, yielded by analysis from thirty to forty per cent. India rubber is in the shape of balls, and is gathered from vines instead of trees. There is no limit to the quantity. Another curiosity was exhibited, a piece of close bark. It is very highly scented. He stated in connection that there were many strange and new woods on the island. Camphor of a peculiar quality, very powerful, and retaining the odor a long time. Sago, mahogany, pine, wild cotton, and all the ordinary tropical plants flourish. Sugar of an inferior quality is made, though better than the China sugar. Sweet potatoes have a red color; no white ones. Bananas measure twenty inches. Gold mines are there, and also stream tin is found, also a great many diamonds, but the natives keep it secret for fear the chiefs will make them work them. Elephants, ourang-outangs, alligators, eight to nine inches long; wild hogs, of which the island is full; goats, no sheep; cattle and ponies, fourteen hands high; plenty of domestic fowls in the villages, but none found wild; no turkeys, either wild or tame. Rivers are full of fish, same variety as are found in the China sea. He never saw any centipedes, but large and venomous mosketoes, as also scorpions. Wax is produced in great abundance. The natives do not care for the honey. The cigars are about three feet long, and made from the inner leaf of the Nico palm. It takes a day to smoke one. Upon visiting the Sultan, cigars are passed around on entrance, and it is considered an insult unless it is all smoked. Thus a great deal of business can be done. Kimanis, the name of the American settlement, means a very sweet smelling wood, on account of the abundance of Cassia wood around it. The settlement is rapidly progressing. In the Kimanis river the tides rise four feet. All are bar rivers on the western side, and yet about every other one, as soon as you get past the surf, contains drinkable water.

Mr. Torrey was listened to attentively, and applauded warmly on the conclusion of his remarks. The Association then adjourned until Thursday, November 21st.

## November 21, 1867.

Prof. S. D. TILLMAN in the chair.

The Chairman presented the following scientific items:

### TESTING COGNAC.

A correspondent of *The London Chemical News* states that the aroma left on slow evaporation of genuine spirits, when gently evaporated in the hollow of the hand, is so very characteristic that it is used as a criterion in the South of France to distinguish between pure *esprit de vin*, *esprit de marc de raisin*, and the spirituous fluids obtained from grain and beet root. It is impossible to entirely eliminate from the latter the fousel oil, but this is never present in spirits made from wine, which, on the contrary, always contain small quantities of œnanthic and acetic ethers. The smell left on evaporation of spirits not made from wine is so peculiar that it may be even recognized in the ether made from this spirit. The ripeness of the wine, its age, the grapes it was made from, and the whole process of fermentation, leave an indelible impression on the quality of the spirits obtained. Since the ravages occasioned by the grape disease it will be difficult to procure from France or Spain really genuine spirits.

### BRONZE COLORED IRON CASTINGS.

We lately described the process used to produce the celebrated Berlin castings, but specimens, since seen at the American Institute Exhibition, prove that castings equal, if not superior, to the Berlin in fineness and finish, have been made in this country. An improvement of great importance in fine iron castings has been brought out in America, which is destined to work a revolution in the use of iron for ornamental work. By the application of oil to the metal in a new way, it is made to assume permanently the color of bronze, and in this condition it is said the metal is much less liable to corrosion. The impression made abroad, by similar samples at the Paris Exposition, is shown by the following extract from a letter by the special correspondent of *The London Daily Telegraph:* "It has long been acknowledged by those familiar with metallurgy that no finer material than iron exists for the purpose of making ornamental castings. In cast-iron a delicacy and sharpness of finish can be obtained scarcely producable in any other metal. The natural hue of iron, however, is decidedly inimical to its use in the fine arts. Polished, it is cold and cheerless as an empty grate; dull, it is livid, heavy, and lugubrious. No pigments in imitation of bronze which have hitherto been applied to the surface of iron have been found durable, and if applied too thickly the fineness of the detail in the casting is lost. Some years since Mr. Hiram Tucker, of Newton, Mass., commenced a series of experiments with the view of overcoming the difficulty of producing a handsome and durable color in iron, while preserving the sharpness of its ornamentation. About four years since he succeeded, by skillfully adapted chemical means, in imparting a hue to iron completely fulfilling the purpose in view, and the material, thus rendered applicable, is said to equal the best French bronze, both in appearance and durability, while it can be produced at one-quarter the price. A company was forthwith organized at Boston with a capital of $450,000, and the Tucker Company now manufacture gas and kerosene chandeliers, clock cases, lamps, pedestals, brackets, and statuettes, which will bear all the tests in use to criticise the finest bronzes in France. I have not the slightest doubt that within a few years, when the services of a staff of artistically trained modelers have been retained by the Tucker Company, statuettes and statues, not only of all the personages famous in American story, but groups and figures illustrative of the best epochs in ancient, mediæval, and modern art will pour from their foundery. In colored iron, substitutes for bronze can be sold at wonderfully cheap prices; but the success of the enterprise may lead to the manufacture of bronze as genuine as any that was made in old Rome. For the present, as I have said, the *dulce* cedes to the *utile*, and the call for imitation chandeliers, lamps, and clock-cases has reached beyond the States, and extended to Berlin, St. Petersburg, and London. No higher compliment could be paid to the Tucker Company than that recently vouchsafed by King William, of Prussia, who, after a long and attentive examination of the works in colored iron, in Mr. Hiram Tucker's exhibit, ordered a chandelier and other articles for the Library of the Royal Palace at Berlin. King William, as a true Berliner, knows what can be artistically done with iron; and Berlin art-work in iron, wonderfully as it is wrought, presents precisely the same disadvantage—repulsiveness in color—which the Tucker Company have so successfully surmounted."

### A NEW FLUORESCENT SUBSTANCE.

Mr. Goppelscroeder has extracted from Cuba wood (the best kind of *Morus tinctoria*), a substance intensely brilliant, with a green light, which is therefore important in the theoretieal study of the phenomena of fluorescence.

### MINERAL WEALTH OF YESSO.

Mr. Gower, a British Consul in Japan, gives a glowing account of the remarkable deposits of lead, iron, and coal in the Island of Yesso. In one place coal forms the sea cliffs; in another, he walked four miles over an iron land containing over sixty per cent of metal.

### IODIDE OF POTASSIUM AND CADMIUM.

Marmé has found that this substance is an excellent reagent for vegetable alkaloids. It precipitates nearly all of them. Morphia, for instance, is thrown down in the state of a glutinous mass, from strong solutions, while from weak ones it is precipitated in relatively large feathery crystals. Guinia and strichnia are completely precipitated even when diluted with 10,000 parts, by weight. The precipitates are not soluble in ether, but are easily taken up by alcohol, less so by water; aad they are redissolved in a surplus of the reagent.

### BORNEO CAMPHOR.

This variety of camphor, which commands in the Eastern markets about twenty-eight dollars per pound, is obtained from the baru tree. The slopes of the hills on the eastern coast of Borneo are covered with these trees. To gather the camphor, the tree is felled and split; and in its center the gum is found. The average amount taken from a tree is not less than ten pounds. The quality of this camphor is superior to all other varieties. A small fragment emits a very strong odor, and does not seem to lose its power for several years. Some idea of the estimate in which it is held by the Chinese, may be had from the price it commands. Formosan camphor may be purchased for about sixteen cents per pound, while the baru brings one hundred and seventy-five times more. Mr. Torrey, an American resident of the Island, and having control of the northern territory, has lately brought to this country, specimens of camphor, hard woods, and other interesting materials which might be imported on a large scale with profit.

In the liscussion following the reading of the item on "bronze-colored iron castings," Dr. L. Feuchtwanger said that one kind of bronze coloring is made with platinum and plumbago.

D. W. Bradley stated that he tried this bronze on clocks, and found that it oxydized very much; but it is now claimed that this objection has been removed. Sufficient time, however, has not elapsed to prove this.

Dr. John B. Rich remarked that the armory of the Seventh Regiment, an iron building, was oxydizing very rapidly, so that fears are entertained of its being seriously injured in a short time. Scales after scales of rust are continually dropping off.

Mr. D. Blanchard said that all the iron columns he had seen, after being taken down, and which had stood for a long time, showed no signs of oxydization whatever. They presented the grayish-blue appearance usual to cast iron when first cast.

Dr. D. D. Parmelee stated that the oxydation of iron comes from the decomposition of water in the atmosphere. An iron column that permits the damp air to pass through it, will inevitably be oxydized.

Mr. Norman Wiard remarked that cast iron will not oxydize but a small way after having a slight coating of oxide, but wrought iron will.

Dr. D. D. Parmelee said this coating of oxide will in a short time be no barrier to oxydation if in the open air. It is going on every day in our water pipes. The oxide of manganese brought in contact with iron will produce a second oxydation.

Dr. L. Feuchtwanger stated that manganese is much used to protect iron. The paint that is used for coloring, is merely to prevent the air from attacking the iron.

Mr. Norman Wiard said that the coating of English guns with bronze was found very beneficial. He had seen some bronzed guns in good condition after being on for twenty years. He had seen it stated that brass and iron, in contact, produced a galvanic action that prevented their use in guns.

Mr. J. K. Fisher remarked that the fusing of brass and iron in the casting stopped the galvanic action. This was known years ago.

Prof. P. H. Vanderweyde stated that there are oxides that protect oxydation. The watch-spring made blue, is a thin film of oxydation. A very thin film of the phosphuret of iron is what protects Russia iron so long.

Dr. L. Bradley related his experience in protecting sheet-iron pipes from oxydation. British luster, asphaltum, varnish and other articles failed to effect that object, even when the iron was kept in a very dry place. What he found to answer best was simple shellac, mixed with lamp-black.

Prof P. H. Vanderweyde said he found lamp-black varnish, made from coal-tar, to be the best protection for iron pipes.

Dr. John B. Rich tried melted paraffine on the inside of sheet-iron pipes, and found it to answer very well. He coated his dental instruments with it, by heating them and plunging them into paraffine, and they afterwards were perfectly free from oxydation.

Dr. D. D. Parmelee found plumbago, which resists the heat of the blow-pipe, to be the best preventive of oxydation.

## *OXIDE OF ANTIMONY.*

Dr. L. Feuchtwanger exhibited a specimen of antimony ochre. This mineral is now much used in glass-making. The Doctor exhibited a beautiful porcelain lamp-shade, which contained the oxide of antimony. He also exhibited a mineral found in great abundance in Nova Scotia, and is used in making paint. It is simply an oxide of iron.

### *WIARD'S STEAM SAFETY APPARATUS.*

Mr. Norman Wiard said he had just passed over a portion of the Pennsylvania railway, and was on a locomotive which had on his apparatus for equalizing the heat of the steam in the boiler. Immediately after leaving Harrisburg, the water was blown out of the boiler to about eight inches below the crown sheet, and then the water injector was applied, which filled the boiler before reaching the next station. His apparatus prevented the fusible plug from melting, showing that he was thus able to diffuse and equalize the heat. This apparatus, which has been fully described in a former volume of the Transactions of the American Institute, carries the water from the bottom of the boiler into the top of the steam chamber, and the greater the difference in the temperature, the quicker will the exchange take place.

The next Thursday being Thanksgiving day, the Association adjourned to the first Thursday in December.

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## December 5, 1867.

Prof. S. D. Tillman in the chair; J. Wyatt Reid, Esq., Secretary.

A large audience had assembled to hear the discussion on that branch of the art of tanning of leather which relates to the process of extracting the virtues of tan-bark. Mr. Abraham Steers read the following paper on

### *LEACHING BARK.*

*Gentlemen:* I feel much pleasure in meeting those who this evening give me an opportunity of offering to them some explanations of certain patents, and of making some general remarks on the leaching or spending of vegetable substances.

And as it is important to me that these explanations and remarks should, without mistakes, reach others who have not so favored me, I have concluded on reducing them to writing.

With all classes of tanners, the consumption of bark enters so materially into the manufacture of leather, that to them it is unnecessary to expatiate on the importance of obtaining therefrom all its tanning properties, before they decide that its further exhaustion is to be considered profitless; nor on the importance of the adoption, by tanners, of such a system of leaching as will not fail to prevent the bark from undergoing such chemical changes during the process, as would lessen the amount of tannic acid or astringent salts derivable thereout; being at the same time a system which will enable the tanner to obtain from his leaches, as a reservoir, any strength and quantity of properly conditioned liquors, that the condition and nature of each kind of leather he has in progress, will at any and all periods (in the operating of his tan yard), render desirable.

Before examining to what extent my patents (of the 11th of March, 1856, 2d of January, 1867, 12th of March, 1867, and 20th of August, 1867, for leaching bark, making liquors, and manufacturing bark extracts) have accomplished those ends, beyond the means now in general use among tanners, I will make some preliminary observations on the experienced operations of chemists, and of such natural phenomena, with their causes and effects, as appear to me to have an associate bearing on the objects a tanner endeavors to obtain by leaching bark; and though their recital may only call to your recollection your own previous observations of the same facts with regard to leaching, yet I deem it essential that their consideration should be fresh in your memory while I read or explain the value of, and the ground covered, or intended to be covered, by the patents and re-issue for the improvements which I now offer to the consideration of the public.

I would first call your attention to those facts which are most prominently worthy of the attention of tanners who are using hemlock bark; because that bark possesses extraordinary powers in the retention of its tanning properties, as for instance:

1. Saw logs of hemlock trees, after lying for months immersed in a mill-pond, will admit of being peeled, soon after the true season of peeling has commenced, and then yield a bark little inferior for tanners' use, to that cut down and peeled in due season.

2. A leach of hemlock bark tan (in common with the tan of oak barks) will drain down a few pails of strong liquor, after it has yielded to water with which it has been well boiled, a liquor only measuring two and a half degrees barkometer proof.

3. Which leach of hemlock bark tan will subsequently yield to proper steam application, a liquor measuring ten degrees in a quantity of liquid equal to one-half the bulk of the bark or tan operated on, that being the general proportion or quantity of a liquor to cover the bark in leach.

4. And selected pieces, picked from that which has been for years in ploughed ground, will give a similar or greater yield.

Now whereas, there is eleven per cent of dried astringency or pure tannic acid in well saved hemlock bark, and tanners are only making an average of one hundred and fifty pounds weight of leather with every cord of bark they use, the facts I have just stated clearly show where a large proportion of this missing tannic acid is thrown away. But we will have to thoroughly scrutinize our system of leaching to discover where a still missing balance goes to; for it is an astounding fact, that the carefully kept statistics of large American tanneries show, that the average exhibit of the quantity of the tannic acid put into their leather, does not exceed five per cent, which is less than one-half of what the bark contains; and it is a self-evident fact, that many tanners are, as it were, burning the candle at both ends, by destroying some portions, while they are leaving the beforementioned share after them, still held in the tan-bark.

Having thus explained to you the grounds of my faith, in the belief that time and money can be profitably expended in making improvements on the present modes of spending bark, I will particularize some familiar correlative facts:

1. What tanners call spent tan, is commonly selected as an ingredient to stop leaks in the bottom of canals, as the settlement of its finer particles in the crevices or leaks is found a sure preventive against the water leaching or leaking through.

2. The fine particles of wood ashes, as they are carried down by the lye in leaching, become arrested in every fissure, till they form an impenetrable stratum, through which no liquid can pass—a difficulty which is very improperly met by breaking holes through with a crow-bar.

3. And the impossibility of operating on Sicily sumac by the tanner's manner of leaching bark, are all different instances of the same cause, producing the same effect as that which causes the clogging of tanners' leaches, the passage of the menstruum through gutters within the mass, and thus finding passages around the ground bark, and not through each piece, as it should.

Now, on looking to natural phenomena, we find that all descending waters carry with them more or less impurities, increased in quantity in a ratio with the increased force of the current, and constantly clogging up its old, and creating new passages to escape through; while in a leaching point of view, we can find in nature but one grand remedy for all these difficulties; being a remedy strikingly illustrative and suggestive to a tanner, when observing that the water of a disturbed spring well will become clear in the face of the descending muddy water, and that almost before he has ceased to stir it; and, moreover, that all such ascending waters (no matter what compose the strata through which they ascend), become perfectly defecated from all particles, though not purified or freed from the impregnated properties of the mineral strata, through which they have been leaching in their upward passage, whether they have been thus impregnated with salt, sulphur, or combined chemicals.

And we find this principle of leaching recognized and adopted by the experienced chemist, who scientifically leaches upwards through a suitable glass vessel, provided with a filling of sponge, or such other filtering substance as may be required by the peculiar properties of the material under operation, or the purposes for which the operator needs the solution; this system of leaching being essentially requisite in instances where the material is too gummy to admit of being leached downwards, or that a liquid well defecated from all foreign particles is needed; and when perfect defecation is not necessary, and that the nature of the ingredient will admit of a downward leaching, while a concentration of the virtues is alone wanted, then the operator having placed his ingredients in a suitable position for percolation, performs his operation with a *minimum* amount of *fluid*, supplying it through a percolating diaphragm of paper in a gentle *sprinkling or trickling* on to the surface of the ingredient, from whence it passes through each particle of the mass, and is constantly returned to the surface, till as much of the valuable properties of the ingredient as are readily dissolved in water, wine or alcohol, are impregnated with or carried down by the liquids to the provided receiver beneath the mass operated on.

I will now advert to a few more familiar facts, and examine them in their narrower and more direct bearing on dissolving and removing the astringent salts or tannic acid from bark by "steaming it in a damp condition," the retention of the tannic acid by every separate particle of the tan, and its removal:

1. Water will be found to enter but a short distance into a barrel of flour, immersed in it for weeks.

2. Starch, meal and flour boiled in water, after it has been carelessly thrown in, will form into lumps, dry in the inside, the water having never penetrated to the center of the lumps.

3. A nutshell, which requires great force to break it by an

external application, is easily burst open by a comparatively slight force created by the enlargement of the kernel.

4. The infusion of large blocks of limestone with moisture, by the application of steam, causes them to burn and crumble with one-third the amount of heat required to burn broken limestone, in the usual manner of burning it.

Is it not evident that if the swelling of the outward particles of the flour in the immersed barrel, and of the lumps of flour and starch formed in the boiling, causes such a close approximation of their external or outward component parts as to become impervious to the surrounding water, or that this imperviousness is produced by the presence and resistance of air inclosed within the large and the small quantities of flour and starch; or that the water is prevented from entering in by a çombination of both causes, that we can, on precisely the same grounds, account for the fact why the center of each piece of ground bark retains so long such a considerable portion of its tannin, as is exhibited by its dry, hard center, on being broken?

A due consideration of these facts, together with the remedies for some of them, the comparative effect of an external and internal force or pressure on a nut shell, and the application of internal force upon blocks of limestone, will enable you to estimate and understand the causes and effect of steam upon even, unground bark when in a damp state, and will account to you for its immediate thorough softening, and the facility with which its tanning properties thus dissolved, can be removed, and for the ground and unground bark being then reduced to a perfect *caput mortuum*, almost worthless as a fuel, the burning quality of spent tan being always a true criterion of the extent to which the proper leaching of the bark has been completed.

In upward leaching, the liquid as it advances upwards permeates equally through every part of the leach, whatever its shape, as well as through every particle of the bark contained therein, displacing out of each piece the inclosed air as the liquor advances upwards. No formation or clogging of impenetrable dust takes place; the liquor comes off as clear as brandy. A more perfect leaching or spending of the bark, and in much less time, is thus effected.

And I will now add, that no expense is needed to enable your present leaches to be worked as upward pressed leaches, beyond what would be or is needed to enable them to do the work they are now intended to do, in a proper manner.

With these preparatory explanations of principles, for the adoption of which, by tanners, I have been long advocating, I will now proceed to the examination of my patent and re-issues for the years 1856 and 1866, and of particular portions of them which have been the subject of much comment, and on which I would like to offer some explanatory remarks before proceeding with the simple reading of both instruments.

Beginning at the 11th and ending at the 15th line of the first page, inclusively, you will find these words:

"This invention relates to a new process of extracting tan-bark and other vegetable substances, and it consists principally in the application of steam to damp bark, or other substance, so that by the action of moisture the bark or other substance is swelled, and its pores are opened, and if the steam is admitted, it is enabled to penetrate said bark or other substance, and to effect a perfect separation of the soluble and insoluble parts thereof."

To a tanner who is accustomed, with steam, to boil his bark immersed in fluid, whilst the bark rests on a false bottom, perforated with holes throughout the whole superficial area within the leach, the foregoing words, "This invention consists, principally, in the application of steam to damp bark," cannot fail to address themselves intelligibly; and though the construction of his leaches would admit of his running down his liquor and steaming his (then) damp bark, yet he cannot fail to discern the novelty of the invention as an innovation upon all his previous habits and experiences; and he will not only recognize by the foregoing words of my patent what I intended to do in the premises, but will also admit that these words are a sufficiently "full, clear and exact description, to enable those skilled in the art to use the same;" and I think no sophistry or special pleading could make any intelligent tanner believe that by lessening the superficial area through which the steam could pass up to the bark, the force of the steam or the result of its application could be increased, or that there is any loophole left by me in this description of my *modus operandi* for another to invent the application of steam to damp bark.

I will now refer to the wording of the 11th and 13th lines of the 2d page, inclusive: "My method of dissolving, displacing and concentrating the soluble portions of any suitable vegetable substance, is as follows, viz: the vegetable substance properly disintegrated is placed within the percolator, and is then saturated with any suitable menstruum."

To the first three words of this paragraph, I will call your attention immediately, in connection with another and separate introduction and interference of another part of my improvements for the leaching and spending of tanner's' bark; as I wish for the present, notwithstanding the unavoidable and constant recurrence to the fact and manner herein described (of my washing the tannin from bark), to confine our consideration and attention of the foregoing words, in their application to my priority claim for the using of steam on damp bark as distinguished from the using of steam on bark immersed in fluid.

I have herein used the term, disintegrating any vegetable substance, as a substitute for the term grinding, because I contemplated the application of my invention to other vegetable substances, that could not be disintegrated by grinding, after the manner employed to grind brittle dry bark; and I have used the term "percolator," as a substitute for the tanners' term "leach or spender," because I wanted a more comprehensive designation, wherewith I might not only cover, but, to some extent, indicate, the additional objects and uses of the invented apparatus to be named; for though a percolator is, to all intents and purposes, a leach, as tanners understand the term, yet no ordinary leach would admit of my showing with it the inventions I was introducing for the improvement of the mode of leaching tan-bark and other ingredients.

And you will bear in mind the necessity I was under to describe my *modus operandi*, as applicable to a drawing and model of some one apparatus, by which I had to exhibit a new and most invaluable invention for the procurement of a pure, aqueous menstruum, derivable from, and continuously derived out of, the solution or decoction under progressive concentration, and for the operating of a variety of ingredients.

I had to exhibit by it, as I already explained to you, the steaming of damp bark, for the effectual dissolving and separating of its tannic acid, or soluble parts, from its fibrous or indissoluble portions (while both continue to form the component parts of each piece or particle of bark); and then complete the further and distinct separation, removal, and carrying away of the tannin, in the shape of vegetable solution, to a provided receiver; which I performed, in another improved method on tanners' operations, by causing the menstruum to fall upon the whole superfices of the upper surface of the ingredient under operation, in drops like drizzling rain, and from thence percolating, and trickling down to, and through each and every piece of the underlying bark, or other ingredient within the apparatus, and in such a manner that it should reach the inside of each piece in its passage; absorb, remove, and carry down therefrom the dissolved tannin to receiver M; whereas, with tanners, too often the liquor in a leach is around the bark, but only passes down through gutters, formed within the leach, by the force of the current, and passages, made between the bark and the sides of the leach (by the falling in of the bark in the running off of liquors), while the bark is very imperfectly affected by its passage; and to the verdict of every unprejudiced tanner I appeal, as to whether, because I discovered and improved menstruum for the leaching of bark, and a new mode of obtaining said menstruum, I should be thereby deprived of a tanner's indestructible right to use tan liquor for the same purpose, as is the immemorial habit of tanners, and which no tanner can fail to discern I intended to make use of, when my object would be simply to make tanning liquors of ordinary strength.

Mr. Steers was proceeding to comment further on the merits of his patents when objection was made, and the general discussion of the subject was opened. Jackson S. Schultz, Esq., one of the largest dealers in leather in the city, then took the floor:

Mr. Schultz commenced by saying that this matter might prove very uninteresting to persons outside of the leather trade unless it was illustrated by models and drawings. Every tanner realized the trouble of leaching bark thoroughly, and some of the best paying patents in the trade were for professed improvements in this branch. He said there was eleven or twelve per cent of tannin in hemlock, and seven per cent in oak bark, and at the present high prices and prospective scarcity of the article, it was an object with the tanner to have the process of leaching thoroughly performed. He also referred to the new process about to be introduced to crush the bark, and thus obtain all the tannin, and said if this method was what it claimed to be, the "occupation" of previous inventors in this line would be gone. Mr. Schultz also said that any person who could extract the coloring matter from liquors without injuring the tanning properties could be assured of a fortune.

The Chairman made some able remarks on the importance of the leather trade, which stands at the head of industrial interests in the State of New York; alluded to its growth and prosperity here, and paid a fine compliment to the late Col. William Edwards, styling him the Watts of the tanning trade. The Chairman showed a thorough knowledge of the business, which is accounted for by the fact that his father, the late Andrew P. Tillman, was one of the largest tanners in Western New York, and a pioneer of hemlock tanning in that section.

The Chairman being informed that the patentee of "Pingree's process" for leaching bark was present, gave Mr. Pingree an opportunity to explain his process, on which Mr. P. offered to read certain letters he held in his hand indorsing the patent, but the Chairman replied that letters were not admissible, information in a more practical form being required by the Society.

At this point, Hon. Horace Greeley, president of the Institute, came in and took part in the proceedings, which were becoming interesting, from the fact that several of the leading chemists who had given the subject attention, related facts in their experience. Among these were Prof. C. A. Joy, of Columbia College; Prof. S. D. Tillman, Dr. D. D. Parmelee, Dr. Wetherbee, of the *Journal of Applied Chemistry*, and Dr. Feutchwanger. The debate took a wider range, and Mr. Schultz stated that the tanner was the true civilizer of the country, instancing Greene and other counties in New York where the first settlements and clearances were made by this class of men, and showing that the same process was now going on in neighboring States. He expected to see before a score of years had passed, the exports of hemlock bark extract from this country, for tanning purposes, rank with those of grain. The sole leather of this country was even now exported to Great Britain, and he had seen large divisions of the English army *treading on onr soles.*

This brought up Mr. Greeley, who said that his tanning friends were all free traders, because they could export their leather to Europe. He had that day been asked by a friend who owned a large tract of woodland on the line of the new Sunbury railroad, how the timber could be made to pay for its destruction, and he recommended the establishment of tanneries to use the bark.

The Chairman here asked, alluding to Mr. Schultz's remark that the tanner was a civilizer, "what would become of civilization when the bark was all gone?" Mr. Greeley thought we should, long ere then, be in possession of some other tanning agents, but that over half of Virginia was covered with primitive oak timber, and that there was oak bark enough in Virginia and Maryland to tan all the leather we could get out for very many years. Mr. Steers stated, in regard to waste of bark, that American tanners used twice the amount of that material that the English did for the same quantity of leather.

The remark was made by Mr. Schultz that no country in the world produced better leather, either sole; upper, or calfskins than the United States, and Prof. Joy, of Columbia College, stated that he had for many years made periodical visits to Europe, and had purchased his boots and shoes there. He had within a year or two investigated the subject, and satisfied himself that this was only a fashionable fallacy, and that shoes were made at home, of our own tannage of leather, fully equal to the French. The Professor doubted the fact of bark extract coming into general use, for it was the tannin which coagulated the gelatine, and tannic acid, when liberated from the bark, is liable to decomposition. He stated that the coloring matter in bark liquor is injurious to leather.

Dr. Wetherbee said that the tendency of hemlock bark liquor to change into gallic acid by exposure to the air, is very much less than that of oak bark liquor, therefore the argument is in favor of the former.

Dr. Parmelee, who is connected with the chemical works at Hunter's Point, said it had been stated, that if some one would render the tannin extracted from hemlock bark colorless, but retaining its properties, it would be a valuable discovery. This could be done now by filtration through charcoal. The only object was to make hemlock leather to imitate that tanned with oak bark, and this could be done to some extent by the addition of sumac or other yellowish coloring matter. An objection which had been made by a previous speaker, that hemlock leather colored the stockings, could be obviated by wearing silk socks of the same color.

Mr. Schultz stated that he had that day seen a tannery torn up in this city (referring to the Bryson tannery), which was laid down over fifty years ago. Some pieces of bark which had lain there during the entire period, were found to contain nearly as large an amount of tannin as though the bark had been freshly peeled. He then stated that he had, some time since, proposed to test the relative strength of oak and hemlock leather, by splitting a given quantity of hides, and tanning half in each kind of bark; then putting the leather in alternate strips in a band, and subjecting it to practical use or tension. He would back up his opinion to the amount of at least enough to pay for the experiment, that the hemlock portion of the band would not give out first.

The different subjects were ably handled, and the whole discussion was interesting and practical. Adjourned.

## December 12, 1867.

Prof. S. D. Tillman in the chair.

The Chairman read the following notes on applied science:

### TO POLISH STEEL.

Mr. Stoss, a German engineer, finds that oxide of chromium is the best substance for polishing steel. The article is easily procured, as it is used for painting on porcelain; or it may be prepared by heating to redness the bi-chromate of potash. The neutral chromate of potash is formed while one equivalent of chromic acid is converted to chromic oxide which is easily separated.

### TREATMENT OF DIARRHEA.

Mr. J. W. Curran reports in *The London Medical Times and Gazette* the successful treatment of a number of cases of diarrhea, attended with convulsions, which illustrate the beneficial effects of the therapeutical method recommended by Dr. Chapman. Cold was applied by means of ice-bags at certain points along the spine. It arrests the convulsions with surprising rapidity, and exercises a sedative and specially curative influence over a disease extremely harassing to both physicians and relatives, and often terribly destructive, especially when it attacks children.

### ALLEGED CURE OF THE CATTLE PLAGUE.

Mr. Philbert, a large landowner in Southern Russia, who possesses 80,000 merino sheep, 2,000 or 3,000 horned cattle, and 500 or 600 horses, states that of all the means employed in numerous experiments made by him to preserve his horned beasts against the cattle plague, sea-water, given as a drink in place of soft water, had, during all the epidemic, complete success. All the animals supplied with sea-water were spared by the malady, including those intentionally placed constantly in contact with sick beasts.

### THE STRUGGLE FOR LIFE.

Certain native animals of New Zealand seem to give way before those from Europe, with which they are brought in contact. The Norway rat has completely exterminated the native rat of New Zeland. The English house-fly drives out the blue-bottled native. Capt. Cook carried pigs to New Zealand and they have increased so rapidly that landlords now offer rewards for killing them. English weeds monopolize the soil. European clover exterminates the native flax-plant, and European annuals destroy the New Zealand perennials. These facts tend to prove that organisms of the northern latitudes are more hardy than those nearer the Equator.

### PERUVIAN BARK IN INDIA.

The cinchona succiruba has been completely naturalized in India. It attains a height of fifteen feet in three years, and its bark is rich in quinine. It thrives well only at an altitude of from 4,000 to 5,000 feet above the level of the sea; the bark of that grown in lower regions is much poorer. A recent discovery renders it probable that the tree may be grown with advantage at an altitude of above 2,300 feet, where the coffee plantations are situated. If the trunk of the tree be enveloped in moss for about a year and a half its bark will become excessively thick, and much richer in the alkaloid principle. Two other varieties, generally sold under the name of cinchona pitayo, grow at an altitude of nearly 6,000 feet. These contain about 11.35 per cent of the alkaloid principle, nearly six per cent of which is quinine.

### PROPOSED CANAL IMPROVEMENT.

The *Echo de la Dordogne* affirms that the French Government contemplates a new and vast project of internal improvement. This is to enlarge the Canal du Midi, sometimes known as the Canal of the Two Seas, because it unites the Atlantic and Mediterranean. At present it joins with the river Garonne at Toulouse, and reaches the Mediterranean near Agde; and the Garonne, running across France and emptying itself at Bordeaux, completes the chain of communication. The present canal is not adapted for large vessels, and has, in the course of 150 miles, more than fifty locks; the river portion of the communication can be enlarged with less difficulty. In order to fill the canal when enlarged, it is proposed to intercept the numerous streams on the high Pyrenees and the mountains of Avergne, and imprison the waters in large reservoirs, to be used when needed in the canal. This great improvement will give the French fleet access to the Mediterranean without passing under the guns of Gibraltar.

### NEW PROPERTIES OF ALUMINUM OR ALUMINIUM

Dr. Henry Wurtz, of New York, has discovered that aluminum will absorb mercury, as lead does, and that in this condition it will oxidize so rapidly as to glow and burn the hand. Aluminum foil rubbed into quick silver, on exposure to common air takes fire, and is rapidly consumed, the resulting product being hydrate of alumina.

This oxide is a feathery mass, and is deposited in the form of a coating on the foil, so rapidly that its increase is visible to the naked eye. Aluminum has so strong an affinity for oxygen that it has been found extremely difficult to separate the metal from common clay, which is nearly pure silicate of alumina; but when once separated aluminum does not readily unite with oxygen. It does not easily tarnish in air, and will not decompose water. Being a good conductor of heat and electricity the essential conditions for rapid combustion do not occur, but when the pores of the metal have been filled with mercury, the particles of aluminum in a separate state cannot resist the attack of the oxygen in common air, and the accumulated heat generated by the rapid oxidation of the surface is soon high enough to insure the oxidation of the inner portion of the metal, which it is supposed, the mercury has not reached. Dr. Wurtz does not thus account for the phenomenon; he believes quicksilver produces an allotropic modification of the metal by which it is brought from a passive into an active state; and suggests that it is possible to reverse this action in the case of elements which are easily oxidized, so that strong electro-positive metals like sodium and potassium, by being brought into a passive condition, could be handled and exposed to common air without danger. He concludes that ordinary aluminum is in a passive state resembling that of iron, which, when in contact with platinum, resists the action of nitric acid; and he maintains that iron may be permanently held in that condition. When he succeeds in making one powerful electro-positive metal inert in the presence of oxygen we shall gladly accept his theory.

## HUMAN DECADENCE.

In an able thesis on death, Dr. Acosta, of Paris, discusses the difficulty of determining the commencement of old age, and says the Greeks regarded the age of forty-nine (seven times seven, their climacteric number) as the culminating point of human strength. Another French writer, M. Flourens, however, holds that decadence does not commence until the seventieth year. The Chinese call men who have attained that age "rare birds," and those who reach the ninetieth year "old loiterers." The two climacteric ages of the Arabs were sixty-three (seven times nine) and eighty-one (nine times nine). The first was considered the grand climacteric among the ancients, and those who passed it were accustomed to congratulate each other. Physiologists recognize the existence of two sources of strength in the constitution; one is called the force in use, and the other the reserved force. Doubtless the period of decadence bears some relation to the period required for full development. Those who are long in arriving at the full maturity of their powers, as a general rule, are long in losing their store of reserved force. Bodily strength may be compared to a water-power. During the period of growth, the surplus vitality is used in development, as force is expended in building structures to raise the head and fall of water. Through the term of middle life, the supply of strength greatly exceeds that expended in work, and the surplus quietly passes off like unused water over the waste-weir. When the period of decadence arrives, the stream begins to diminish. There is no longer a residue of unused force. During the day there is no flow of water over the weir, and a whole night is required to bring the head and flow to its accustomed height. Every resource for supply is employed, and care is taken to prevent the escape of unused force. Gradually the constitution is enfeebled, but has not even power to repair bodily waste. The weir crumbles, the leakages are no longer checked. Slower and slower turns the wheel of life, until at last, by some sudden diversion, its scanty supply is cut off, and it has forever ceased to move. To guard the weir of life, to prevent its sudden destruction by fatal disease, and to show how best to repair the damage of constant decay, is the business of the physician. It is said the average length of human life among civilized nations has been greatly increased during the last century. This gratifying result must be accredited in part to the introduction of new remedies for disease; yet it will not be out of place to assert that the most important of all arts — medicine — has not kept pace in improvement with many others affecting the material well-being of man.

An animated discussion took place on the item in relation to the cure of disease by the application of cold, in which Dr. H. D. Sheppard and T. D. Stetson, Esq., bore a prominent part.

## *ACOUSTICS.*

The Chairman presented the following papers, read at the meeting of the Association for the Advancement of Science, held at Burlington, Vermont, in August, 1867:

## I. ON THE OPTICAL METHOD OF STUDYING SOUND.

By Joseph Lovering, of Cambridge, Mass.

When the science of acoustics is studied by means of the ear exclusively, we judge of the process simply by the result, that is, by the sensation. The optical method of investigation often gives us an insight into the process itself. Sound begins with a stationary vibration in the sonorous body; it is propagated by a progressive undulation; and it ends, physically and mechanically considered, in a vibration of some one of the three thousand nervous filaments discovered by Corti in the labyrinth of the human ear. Whether we regard the sound, therefore, at its origin, in its promulgation, or in the sensation, it is nothing but a vibration; and vibration is motion, and motion is the subject of vision. So that to see sound is only to see the motions which cause it. The only difficulty of seeing sound lies in the fact that the acoustic vibrations are upon a microscopic scale of magnitude, and, by their quick succession, the separate effects of individual vibrations blend into one sensation, in the eye as well as in the ear, by virtue of what is called in both cases the persistency of the impression on the organ of sensation. To overcome the first difficulty, a beam of light is reflected from the vibrating body, or a mirror attached to it, which moves *in angle* twice as fast as the body itself, while the motion *in arc* may be amplified to any extent by increasing the length of the beam of light. The second difficulty is surmounted by reflecting the vibrations of the sonorous body itself, or some more visible effect which they originate, from a revolving mirror. By this device of looking at the image of the body, instead of the body itself, its vibrations, which coexist in space, are disentangled from each other, and movement vibrations, hundreds of which succeed each other in a single second of time, are translated into a long belt of space, in which even two successive ones do not overlap.

The optical method of studying sound embraces, in general. Savart's contrivance for discovering and exhibiting the nodal lines of plates by means of sand sprinkled over their surface, the investigation of the nodes and bellies of sounding strings by mounted riders, and of columns of air by a little drumhead suspended in the pipes, and, more recently, Lissajous' mirrors attached to tuning-forks, etc., Koenig's flames played upon by vibrating columns of air and reflected in a revolving mirror, and, finally, Melde's strings excited by the sympathetic vibration of an attached tuning-fork or bell.

The present communication is confined, however, to Koenig's reflected flames, in which are seen the individual vibrations of an organ pipe; by which can be beautifully demonstrated to the eye: First, that the number of vibrations increases with the audible pitch; second, that coexisting vibrations produce maxima and minima of motion corresponding to the beats which are recognized by the ear; third, that one column of air will respond, in sympathetic vibration, to another when there is an agreement between their fundamental notes or some of their harmonics; fourth, that two unison-pipes, brought into intimate neighborhood, will move so that the vibrations of the air cross one another and produce silence, as Savart showed experimentally in the case of pendulums of equal length vibrating in company.

This peculiar case of unison-pipes I have made a subject of special investigation. In complex cases, it would doubtless be impossible so to arrange the voices and instruments that the total volume of sound should be multiplied in the same ratio as the number of performers. The effect of a large chorus or a large orchestra will disappoint expectation, from the unavoidable interferences of sound-waves. But in the simple case of two unison-pipes, can they be prevented from silencing each other? The remedy for the evil would be: First, to sacrifice in a measure the perfection of the unison; or, second, to place them at a distance beyond each other's influence; or, third, to separate them by one-half of the wave-length which propagates a sound of the given pitch, or by some odd multiple of that quantity. The latter remedy would answer for auditors in the direction of the line which united the two pipes, though not for the audience generally. In studying the effect of position, I have made the following experiments, the ear being the judge; or the eye, looking at the broken ribbon of light in the revolving mirror.

I. The pipes are placed side by side by side.
   1. With similar ends together, they silence each other.
   2. With dissimilar ends together, they silence each other.

II. The pipes are placed with their axis upon the same straight line.
   1. If similar ends are together, whichever of the two ends be selected, they silence one another.
   2. If dissimilar ends are together, they silence each other.

III. The pipes are placed at right angles to one another, with one extremity of each pipe at the angle.

*Fig. 1.*

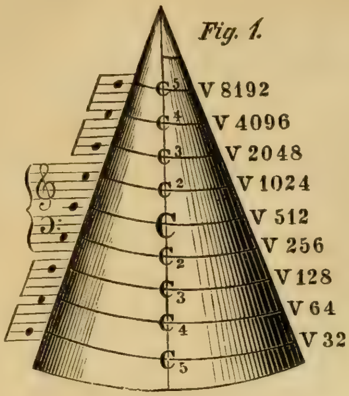


*Fig. 4.*

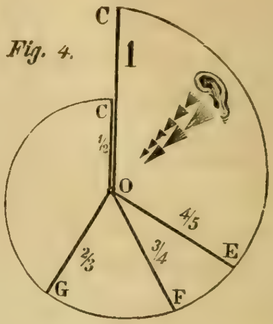
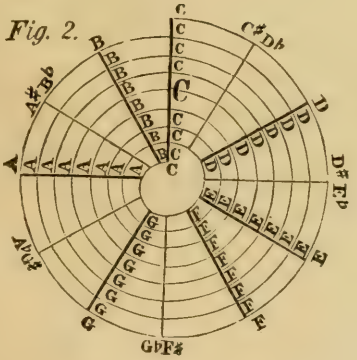


*Fig. 2.*



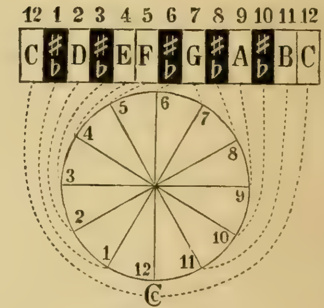


*Fig. 5.*

*Fig. 6.*

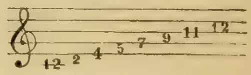


*Fig. 3.*

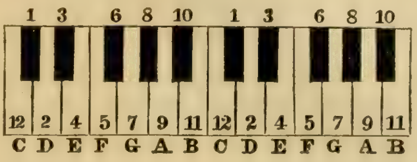
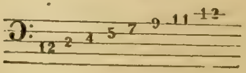


*Fig. 7.*



1. If the ends that are played are at the angle, the pipes reinforce each other.
2. If the other ends are at the angle, they tend to silence each other.
3. If dissimilar ends are at the angle, they reinforce each other.

In all these experiments the pipes employed were open at both ends.

Now that science is in possession of this delicate optical method, which requires for its success no nice musical ear, other problems, heretofore settled by assumption, may be brought within the range of demonstration.

## II. ON A METHOD OF MEASURING MUSICAL INTERVALS UPON A SPIRAL PROJECTION.

By Samuel D. Tillman, of New York City.

Vibrations, producing the different sounds of the diatonic scale, have fixed numerical relations. Starting from the first or lowest sound, and proceeding upward, the eighth sound is found to harmonize most perfectly with the first; proceeding still upward, the fifteenth is found to harmonize just as perfectly with the eighth, and the twenty-first with the fifteenth. Each of these four sounds are, therefore, regarded as the first in a distinct, but similar, series, embracing seven sounds. The vibrations producing each sound of the first series are, to those causing a similar sound in the second, as 1 to 2. This natural division of musical sounds into septaves is not clearly shown when the characters or signs representing these sounds are arranged in one right line, as found in all popular systems of instruction; moreover, the ear, in demanding the addition of the octave, as the terminal note of the diatonic scale, helps to mislead.

To obviate this difficulty, I represent the progress of pitch, from the lowest to the highest musical sound, perceptible to the human ear, by a line passing spirally around a cone, as seen in Fig. 1.

Each ring measures a septave. A right line drawn from the apex to the base of the cone cuts the spiral at each point where there is an apparent return to the tonic by a repetition of the octave. All the sounds known as C are shown. On the right is the number of vibrations producing each, assuming that the middle C has 512, or is the ninth octave of an imaginary sound, having one vibration per second. The French standard pitch requires for this sound 522 vibrations per second. On the left are the positions of all the notes C on the staff, as fixed by the base and treble clefs.

Twelve similar right lines, at equal distances around the cone, would represent the intervals of the chromatic scale, as made by keyed instruments; and seen from the top of the cone, they would appear as shown in Fig. 2, which measures all the intervals made on the largest sized organ.

The true spiral projection, representing a single septave, is shown in Fig. 4. The line CO being the length of a string or pipe giving the sound C; and c O a similar string or pipe, half as long as the first, which gives a sound an octave higher than the first sound. The perfect concord of these two sounds arises from the fact that every wave of air producing the lower sound strikes the ear simultaneously with every other wave causing the octave.

The intermediate sounds of the diatonic scale would be measured on the septave by lines proportionate to the length of strings or pipes producing such sounds. Only three are shown at E, F and G. The ratio of the vibrations producing these sounds respectively with those producing C being as 4:5, 3:4, and 2:3. The generation of a spiral on this plan, to embrace every septave, requires that the length of the radius vector should be doubled with every revolution of the generatrix, and would, therefore, on account of its size, be quite inconvenient. For general use I substitute a true circle for one ring of the spiral, and divide it into twelve equal parts or grades to represent the tempered intervals of one septave, as made by keyed instruments. It resembles the ordinary watch dial, 12 being the starting point or the tonic of the natural key. The position of the figures on a watch face being so early learned and so familiar to every one, there is but little difficulty in adapting them to musical intervals. Inverting the circle of figures, its application to the keys of a piano, or an organ, are shown in the annexed illustration, Fig. 5.

Two septaves of keys are shown in Fig. 3. The numbers 12, 2, 4, 5, 7, 9, 11 correspond with the letters designating the notes of the natural key of C, while the numbers 1, 3, 6, 8, 10 designate notes used in other keys. This application of numbers to the twelve sounds embraced in a septave obviates the necessity of sharps and flats which do not properly belong to the tempered system employed on keyed instruments.

The position of the numbers used in the key of C, on the staff, as fixed by the base and treble clefs, are shown in Figs. 6 and 7.

These preliminary statements will make plain the use of my tonometer, which measures to the eye all musical intervals. (The instrument was here presented by the speaker, and illustrated on the blackboard.) It consists of a sheet or plate containing a circle divided into spaces representing the intervals of the true as well as the tempered system. A division of the circle into equal spaces, so as to measure by multiples of one such space all intervals that can be made by modulations, would be so minute as to be of no practical service. I have substituted a near approximation to the true intervals by dividing the circle into fifty-three equal parts called commas. The comma used is the difference between the first and the second intervals of the diatonic scale, expressed by the ratio of $\frac{81}{80}$. Taking the ratio of the air-waves producing each sound of the true septave with those producing the tonic, and deducing the ratio of the several sounds with each other, we have the following ratios of intervals: $\frac{9}{8}$, $\frac{10}{9}$, $\frac{16}{15}$, $\frac{9}{8}$, $\frac{10}{9}$, $\frac{9}{8}$, $\frac{16}{15}$. The first three ratios being nearly as the whole numbers 9, 8, 5, we may measure the so-called major-tone, minor-tone, and semitone intervals of the septave by 9, 8, 5, 9, 8, 9, 5=53, or the whole number of units in the circle.

The same circle is also divided into twelve equal parts representing an isotonic temperament of the chromatic scale, applicable, however, to keyed instruments tuned by allotonic temperaments.

Within this fixed circle is a movable circular disk, having upon it the same divisions, representing the true and tempered intervals. As the notes of the septave have the same fixed relation, it is evident that the position of the movable tonic at any pitch shown on the fixed circle will determine the position of every other note on the same circle. The notes of the septave represented on the disk are distinguished by the common syllables used in solfeggio, and the numbers by which they are known in figured base. Within the movable circle, representing the intervals, and in the major mode, is another series of signs, representing the notes of the minor mode. Thus completing the symbols for one key, by turning the tonic sign from C to G, D, A, E, B, and F sharp respectively, we see at a glance the notes belonging to each key in a modulation by sharps. Again, starting from C and passing to F, B flat, E flat, A flat, D flat, and G flat, we find in turn, the sounds belonging to these several tonics. The employment of numbers in the place of letters renders these changes in modulation much more simple, and obviates the unwarrantable use of the terms "flat" and "sharp." In a modulation by sharps, seven, added to the last tonic, gives the next succeeding one; thus 12, 7, 2, 9, 4, 11, 6. In a modulation by flats, five is added; thus we have 12, 5, 10, 3, 8, 1, 6, as the regular order of tonics. Both series begin and end with the same figures. The seven sounds used in each modulation are determined by this simple rule, viz: If the tonic is an odd number, the next two notes are odd, and the remaining four, even; *vice versa*, if the tonic is an even number, the next two notes are even, and the remaining notes odd.

A synopsis of chords expressed by the solfeggio syllables is adapted, by means of the revolving disk, to the twelve different modulations made by keyed instruments.

The relations of sound and color are shown by applying the colors of the solar spectrum to the seven intervals of the septave. Red, made by the lowest number of undulations, represents the tonic; yellow, the mediant; and blue, the dominant. I have elsewhere pointed to the very curious coincidence arising from this arrangement of colors; the darkest color, indigo, falls on the relative minor tonic; and the brightest, yellow, on the brilliant mediant; from which the deduction is made that light, heat, and actinism result from the undulations of the same attenuated medium; that the two forces last named vary inversely as the length of undulations, while the perception of light and color results from the ratio of undulations embraced in a single octave.

The intervals of the three major and three minor common chords are respectively measured by 4, 3, and 5 grades and 3, 4, and 5 grades. Discovering that, in each case, the sum of the squares of the first two numbers was equal to the square of the third number, I was led to represent these triads by right-angled triangles. In *comma* terms the equation is $17^2+14^2=22^2+1$. The same terms show that twelve consecutive fifths overlap seven consecutive octaves, that is, $31\times12=53\times7+1$.

Further deductions have been made which are, however, foreign to the purpose of this paper, but this singular relation of lines and angles to the harmony of color, as well as sound, does suggest that there are certain connecting links between form and motion, the discovery of which may reveal, partially, at least, those processes of nature, producing both permanency and growth; and that, eventually, man may comprehend the operation of those wave-forces which, by harmonious blending, shape cell and crystal and define the forms of leaf and flower.

In conclusion, I would advocate a change in the solfeggio syllables which gives each a vowel termination, and, at the same time, assists the vocalist in determining their harmonic relations. This slight reform only carries out what seems to have been the original intention of the early masters. The Greeks applied to their tetrachords the syllables *Ta*, *Te*, *The*, *Tho.* Although their system was early supplanted by the septave, no improvement in solmization was made until, in the eleventh century, Guido Aretino designated the first six sounds by different syllables. He was led to their use by noticing a marked relation between the ascending sounds given to the first syllables of the following hymn to St. John:

Ut queant laxis,
Resonare fibris,
Mira gestorum,
Famuli tuorum,
Solve polluti,
Labii reatum,
Sancte Johannes.

Regarding this discovery as a special revelation to him, he did not venture to complete the scale, which was done long after his time by adding *si.* The consonant ending of two of these syllables was not favorable to prolonged vocal sound. *Ut* was afterward replaced by *do.* The *l* in *sol*, when followed by *la* did not seem so objectionable, and sol has held its place among syllables which have been used in solmization for eight hundred years. Guido's scale commenced on G, and was sometimes designated by the Greek name, *Gamma*, also by *ut*, from whence arose *Gammut;* thus the discarded *ut* has found a permanent place in the name of the scale. The change I propose is the substitution of *To* for *do*, and of *do* for *sol;* thus *To* will always be found on the Tonic; *mi* on the Mediant; and *do* on the Dominant; and To-mi-do will express the common chord now known as the *first*, *third*, and *fifth.* All chords may be indicated by a combination of solfeggio syllables, and numbers only used to designate the twelve grades of the spiral which represent the twelve intervals of the tempered system.

## III. ON A NEW FORM OF WAVE APPARATUS.

By C. S. LYMAN, of New Haven, Conn.

The class of waves which this piece of mechanism was designed to illustrate, is that whose type is the ordinary ocean wave in deep water. The apparatus exhibits not only the wave profile with its progressive motion, but also the motions taking place below the surface, in the whole mass of liquid affected. Since the motions in the apparatus are essentially the same as in nature, the leading geometrical and dynanimical facts pertaining to the theory of waves are presented with completeness, and in their true relations. The wave theory illustrated is that established by Gerstner, Scott Russell, Rankine, and others, and which teaches that, in such waves, all the particles are revolving synchronously, and in the same direction, in vertical circles. An able analytical exposition of it, by Prof. Rankine, is contained in the *Philosophical Transactions* for 1863.*

The construction of the apparatus is simple. In front of a plane surface are two series of revolving arms or cranks, the length of the lower ones being half that of the upper. Two elastic wires connect the crank-pins of each series; upright wires also connect each pair of cranks, and pass down through a plate into the base. The cranks all revolve synchronously; they thus keep their relative position, and come into any particular position successively, each in its turn. The relative position of the cranks of each series is such, that the directions of any two, in regular order, differ by the same fraction of a whole revolution that the distance between their axes is of a whole wave length. In the apparatus, the length of a wave is divided into eight equal portions, and hence, the common difference in the directions of the crank-arms is one-eighth of a circle, as shown in the figure. The positions of the cranks in each vertical set are always alike. The number of cranks, whether reckoned horizontally or vertically, is arbitrary—a matter of convenience. Their synchronous revolution is produced by any suitable mechanism, such as toothed wheels, rag-wheels with endless metallic ribbon or chain, or cranks and connecting frame. In the original machine, equal toothed wheels, one on each axis, with intermediate idle-wheels, give the required motion. For small machines the third method is used, as in the model for the patent office.

The crank-pins represent as many liquid particles, and the circles behind the crank-pins their orbits. The transverse wires represent lines of equal pressure, or continuous lines of particles, which at rest would be horizontal, and so coincide with the lines drawn just below the centers of the orbits, the upper one of these being the surface line, the lower one a line of particles one-ninth of a wave's length below. The upright wires represent lines of particles which at rest would be vertical. Every point in these moving lines describes its own distinct orbit. The spaces between the wires show the varying distortions of sections of water originally rectangular.

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* It is somewhat singular that this theory, though more than a century old, has, nevertheless, but just begun to supplant, in the text-books, that which explains wave motion as a vertical oscillation of neighboring liquid columns, as in the two branches of a U-shaped tube, a theory commonly credited to Newton; though Newton, in fact, only used it as a convenient approximative hypothesis for a particular purpose, not as a theory true to nature, remarking in conclusion: "Hœc ita se habent ex Hypothesi quod partes aquæ recta ascendunt vel recta descendunt; *sed ascensus et descensus ille verius fit per circulum.*"

The radius of the large circle is made such that its ratio to the radius of a particle's orbit is equal to the ratio of gravity, or the weight of the particle, to its centrifugal force; or, putting $R$ and $r$ for the radii respectively, and $t$ for the time of revolution, we make $R : r :: g : \frac{4\pi^2 r}{t^2}$; hence, $t = 2\pi\sqrt{\frac{R}{g}}$, which is the period of the revolving pendulum whose height is $R$. Such a pendulum, then, will keep time with the wave.

The force acting on a particle being the resultant of its weight and centrifugal force, if the latter be represented, in intensity and direction by the crank-arm or radius vector of the particle, the former, or gravity, will be represented, similarly, by the vertical radius of the large circle, and the resultant of the two by the third side of the triangle, or a line drawn from the top of this radius to the particle. The wire pendulum represents this resultant, and, like it, is always normal to the wave surface.

The measure of the resultant force being the distance on the wire pendulum from its point of suspension to the wave surface, it is seen that when the particle is at the top of its orbit, the acting force is its weight minus its centrifugal force; when, then, the centrifugal force equals the weight, as in high short waves, the resultant becomes zero, and the particle, no longer held by gravity, flies from the crest in foam.

Since the wire-pendulum is always normal to the wave-curve, its entre of oscillation is the instantaneous centre about which may be described an element of the curve at the point of normalcy. Hence if this circle be rolled along under a horizontal straight line, a point within it, at a distance from its center equal to half the height of a wave, will describe a trochoid, which is the wave profile. Consequently, the circumference of the rolling circle is equal to the length of a wave; and the period of a wave is that of a revolving pendulum whose height is the radius of the same circle.

If the describing point be taken in the circumference of the rolling circle, the curve is an inverted cycloid. The cycloidal cusp, then, is the limit of sharpness of a wave's crest, the radius of the orbit being, in that case, equal to that of the rolling circle, or in other words, the particle's centrifugal force equal to its weight. All possible wave profiles, therefore, are trochoids of curvatures ranging between the limits of the cycloid on the one hand, and the straight line on the other, or between the sharp crest breaking in foam and the level of still water. The greater sharpness of the crests than of the troughs, with its cause, is conspicuous in the apparatus.

It is seen also that the crests rise higher above the level of still water than the troughs fall below it. The difference is equal to twice the height due to the orbital velocity of the particle, or is a third proportional to the radius of the rolling circle and the radius of the particle's orbit; that is, putting $R$ and $r$ for these radii respectively, and $D$ for the difference in question.

$$D = \frac{r^2}{R}.$$

The rolling circle is the same for all wave profiles (or surfaces of equal pressure) down to still water, the tracing arm, or orbit-radius, only becoming shorter in a geometrical ratio, with increase of depth. The rate of shortening is approximately one-half for each additional depth equal to one-ninth of a wave's length; or more exactly, putting $r$ and $r'$ for the radii respectively of a surface orbit and of one whose middle depth is $k$, it is

$$r' = r\, e^{\frac{k}{R}},$$

R being the radius of the rolling circle, and $e$ the base of the Naperian logarithms.

The distance of the crank-axes above the horizontal lines on the background corresponds to the distance of the orbit-centers of corresponding particles in wave motion above the position of the same particles when at rest; this distance is a third proportional to the diameter of the rolling circle and the radius of the particle's orbit, or is equal to the height from which a body must fall to acquire the orbital velocity of the particle, or is equal to the area of the orbit divided by the length of the wave; that is, putting $h$ for this distance, $l$ for the wave's length, $v$ for the orbital velocity, and the other symbols as before,

$$h = \frac{r^2}{2R} = \frac{4\,\pi^2\,r^2}{2\,g\,t^2} = \frac{v^2}{2g} = \frac{\pi\,r^2}{l}.$$

The length of a wave whose period is $t$ is

$$l = 2\,\pi\,R = \frac{g\,t^2}{2\,\pi};$$

the period

$$t = \sqrt{\frac{2\,\pi\,l}{g}} = 2\,\pi\sqrt{\frac{R}{g}};$$

and the velocity of propagation of such a wave

$$V = \frac{l}{t} = \frac{g t}{2\pi} = \sqrt{\frac{g\,l}{2\,\pi}} = \sqrt{g\,R}.$$

The motion of the wire pendulum represents the motion of the mast of a raft floating on the wave's surface; the upper portion of each upright wire shows the motion of a long, thin body floating in a vertical position, as a board end down; the varying inclination of the two bodies, or wires, to each other shows the kind of strain produced by wave-action on a floating body, both broad and deep, such as the hull of a vessel.

In shoal water the orbits are no longer circles, but ellipses or ovals, with the eccentricity increasing as the depth diminishes, while the front slope of the wave becomes increasingly steeper than the back, until the crest finally curls over and breaks in surf.

The apparatus has been patented, and is manufactured by Messrs. E. S. Ritchie & Son, of Boston, Mass. Adjourned.

## December 19, 1867.

Prof. S. D. Tillman in the chair.

The Chairman opened the proceedings by reading the following scientific notes:

### SUPPLY OF GOLD AND SILVER.

In the year 1865, the principal sources of supply throughout the world yielded 559,587 troy pounds of gold, and upward of 400,000 pounds of silver.

### GRASS SPONGE.

A vegetable growth, found in profusion on the coral reefs of the coast of Florida, Mexico, and at the Bahamas, called grass sponge, has been used in this country, in place of hair, for stuffing sofas, chairs and beds.

### ACIDS IN MOLLUSCA.

M. Dumas, of Paris, affirms that M. de Luca has found in the liquid contained in the living mollusca about three per cent of sulphuric acid (*elasot*), and that the same mollusca, plunged into water, disengages a considerable quantity of carbonic acid.

### TUNNEL UNDER THE INDUS.

The work of tunneling under this river at Attock, commenced more than five years ago, and afteward abandoned, has been resumed. The entire length of this railway tunnel will be 7,215 feet. Its greatest depth below the entrance will be 182, and the distance between the bed of the river and the roof of the tunnel twenty feet.

### THALLIUM IN COLORADO.

Mr. Z. W. Chase, while prospecting in Colorado during last year, discovered, near Breckinridge, Summit county, a silver lode bearing galena. He states that the vein is about six feet in width, and that an average sample of the ore, analyzed by Dr. Charles T. Jackson, contained a little over three per cent of the metal thallium.

### ANOTHER CURE FOR CHOLERA.

M. Poznanski has lately investigated the effects of prussic acid, administered in minute doses, in cases of cholera and intermittent fever, in which alteration and carbonization of the blood occur. Experiments made on dogs and men prove that half a drop of prussic acid, properly administered, is a remedy for the cholera.

### ICE IN DEEP MINES.

The occurrence of ice in very deep mines in Northern Europe is not unusual. In the Dannemora iron mine at Presburg, in Sweden, in some places the ice is ninety feet thick. In drifts, columns of ice are left in lieu of wood for supports. This fact, however, does not contradict the well known law, which is that pits become warmer in proportion to their depth.

### SUBSTITUTE FOR ANIMAL CHARCOAL.

Dr. Ziegler claims to have used with success a mixture of kaolin or pure clay and carbon, in place of animal charcoal, for refining sugar. The clay is made into a stiff paste with a solution of glue, some fat, oil, resin, or even with coal tar. This is made into short cylinders, about an inch in diameter, by means of wooden molds. These are pressed until they are about half an inch long, perfectly dried, and then burned in a close retort. In order to make the mixture more porous, common salt or a salt of potash is added, and, after burning, the salt is washed out with water

### METHYLIC ALDEHYDE.

Dr. Hofmann has succeeded in forming this aldehyde, which was the only one that had not been previously formed from a corresponding alcohol. The operation is a very simple one. He passes a mixture of the vapor of common air and the vapor of methylic alcohol or wood spirit (*achelat*) through a long platinum spiral, made red hot by a voltaic current, and the desired product is formed. Like common aldehyde, the methylic reduces silver solutions, causing a metallic coating of silver to be deposited on the glass, with this difference, the coating is said to be more solid than that produced by other reducing agents.

### BENZOIC ACID FROM NAPHTHALIN.

Benzoic acid, now largely used in several branches of the industrial arts, may be prepared by a new and simple process recently made public by Dr. Vohl. Naphthaline is first changed into naphthalic acid by means of sulphuric acid and peroxide of manganese. Naphthalic acid is mixed with a surplus of lime, and exposed to a temperature of from five hundred and ninety-six degrees to six hundred and fifty degrees F., in a perfect vacuum. Benzoate of lime is thus formed, and by distilling the lime compound, benzoyl is produced. Benzoic acid is precipitated from benzoate of lime by means of hydrochloric acid. The best proportions for forming naphthalic acid are twelve parts of pure naphthaline, ninety parts of common sulphuric acid, and eighty parts of peroxide of manganese.

### CURIOUS EXPERIMENTS WITH PROJECTILES.

M. Melsen's experiments have excited great interest at the French Academy of Sciences. M. Dumas stated that a leaden ball, falling from the height of about one meter into water, drew with it twenty times its volume of air. The same ball projected by powder to the interior of a vertical cylinder filled with water, and closed at both ends by means of plaster diaphragms, carried with it one hundred times its volume of air. When the initial velocity of the ball was small, the hole made in the plaster was about the same as the diameter of the ball, but when the velocity was greatly increased, the size of the hole was excessively large, and a double border was formed around the holes where the ball entered and passed out of the cylinder. The cause of the increase of the size of the hole has not been ascertained. These curious results led Melsen to try the experiment of shooting through a pane of glass. He ascertained that contrary to the general belief, a very high velocity of the ball, as well as a very low velocity, shattered the glass, while a medium velocity made a smooth, round hole.

## *FIRING THROUGH GLASS.*

An animated discussion arose in relation to the last item. Dr. Vanderweyde said he believed that too great a velocity is apt to break the glass. He had seen the experiments of firing through glass often tried, and they have generally failed. A ball fired at a speed greater than eleven hundred feet a second, would have a vacuum behind it. He had a pane of glass in which a conical hole was cut clean through it by a piece of slate blown from the roof of this Institute during a gale of wind.

Dr. Warren Rowell stated that, in his boyhood, he had thrown marbles through panes of glass, making holes a little larger than the marbles.

Mr. G. Harding remarked that, at the second Bull Run battle, a ball passed through his shelter tent, and then through a pane of glass, without shattering the glass.

Dr. Edwards said he had seen a clean hole made in a pane of glass by a canister shot, during the riots in this city. But it should be remembered that it is only a peculiar kind of glass that will do this. The temperature of the atmosphere at the time of the experiment is also an important consideration.

Dr. L. Feuchtwanger stated that while in a Hudson river railroad car, a pebble was thrown through a pane of glass, making a round hole, and then striking him in the eye.

Dr. Vanderweyde related a similar incident occurring on the Philadelphia railroad—the stone being thrown clean through the glass, and then striking a mirror and shattering it.

Dr. L. Bradley remarked that the cutting through a pane of glass by a ball, might be due to the high velocity of the ball pushing the air before it.

Dr. Vanderweyde read an article, translated by himself from the German, on "Filtering Sirups."

## *ABBREVIATIONS IN WRITING.*

Mr. S. W. Powell explained his method of abbreviations in writing, together with his own improvements and additions. It is not a system of phonography, but a more or less limited series of contractions. For instance, the letter "e" is made to stand for ' the"; "h" for "he," "have" or "has"; "w" for "we" or "with." In the contraction of words of many syllables, he employs some of the strokes of the pen used in phonography; yet the method, as a whole, has some claim to novelty. The speaker stated that by his method he could write from five thousand to seven thousand words an hour, which is about as fast as an ordinary speaker would enunciate. The number of contractions he uses is about two hundred. The system was found to be useful for lawyers in taking testimony, and for students in writing out lectures.

## *ALCOHOL INDICATOR.*

Dr. Ruschaupt explained Mr. Henry Gath's alcohol indicator, a model of which was presented. It is used in the following manner:

To work the tube, a glass cylinder is to be used as measure. The latter is to be filled precisely to the mark with the wine, &c. to be proved. The contents of the glass cylinder will then be emptied to the last drop in the tube, which latter is closed with its stopper. A cylinder is then placed right below the termination of the cooling pipe. After the cooler has been filled with cold water, and the lamp with alcohol, it only remains to light the last named, to set the apparatus agoing. The wine commences to bubble, and nearly at the same time the vapors rise through the opening of the India rubber stopper into the pipe, to be conducted into the cooling pipe; and then, condensed into drops, to come to the receptacle. The distillate having collected therein precisely up to mark ½, the alcohol lamp is to be extinguished, and cold, distilled water, or rain water, added thereto, precisely up to the mark. In order not to transgress said mark, the pipette is used, by which the water can be added by drops.

If then the indications of the hydrometer and the thermometer are marked down, the table accompanying the apparatus will show the precise alcoholic strength of the substance distilled. The table is simple and easily understood.

Look on the first horizontal line for the number corresponding with the indications of the hydrometer, and on the first vertical line for the number of degrees as indicated by the thermometer. On the crossing point of these two lines the exact alcoholic strength sought for will be found.

For instance: The hydrometer shows ten degrees, the thermometer nineteen degrees; the alcoholic substance is then 9.5; or, with other words, the distillated substance contains 9½ per cent of absolute alcohol.

The several parts of this convenient alcohol indicator are inclosed in a substantial box, about 9⅓″ long, 6¾″ wide, and 4¼″ high. It merely takes half a minute to put the apparatus together or to take it asunder.

The alcoholic substance of any spirituous fluid is therewith just as precisely and quickly determined, as by the "Vaporimeter," and without being obliged—as it is the case with the latter—to use fresh-burnt lime.

## *PAPER HATS.*

Dr. Rowell exhibited specimens of ladies' hats, made of paper. The mold is made by coating the ordinary straw hat with plumbago, and then electrotyping it. This is made solid by backing up with lead. The straw is then burned out, which leaves a perfect mold. The paper is pressed in this mold by an hydraulic pump, and becomes so hard that it always retains its shape, and will stand the heat of boiling water for five minutes without injury. It is more durable than the felt hat, and about half the price of the straw hat. Paper and powdered rosin are all that is used in the hat.

Dr. D. D. Parmelee remarked that it was impossible to exactly imitate this grain of wool. Search this wide world over, and no two pieces of wood with the grain exactly alike, could be found. This fact was about being used, with the aid of the electrotype process, to produce an engraving for the backs of our "greenbacks," that would be almost impossible to counterfeit.

Mr. Solomon McIlroy stated that paper was being used for an immense variety of purposes. He had an engine that was packed with paper, which stood very well. Paper felting and paper belting are now much used.

## *PUMPS.*

In the discussion on this subject, Dr. Vanderweyde said that water was kept out of the low land of Holland, by pumps worked by windmills. The pumps were somewhat like the paddle wheels on the stern of some of our Western steamboats. A man was in constant attendance to regulate the surface of the wind sails. This plan was in use for a long time, but now steam is used. With this centrifugal pump, there is a steady current of water obtained, and none of the thumping incident to most other pumps is observed. This pump works with most advantage when the water is kept between the two levels. The concussion or thumping of the piston pump is very great. In the engines used in Holland, one is worked by high pressure, and the other by low pressure. Eleven columns of water are sent up with one stroke of the piston to a height of eleven to fourteen feet, and many tons of water are thrown up at every revolution of the engine. This style of pumping has many objections, and the American centrifugal pump would do the same amount of work with much less loss of power, and less liable to get out of order.

Mr. Charles E. Emory stated that at the Brooklyn Water Works they use two pumps, working alternately. There is not so great a loss as would at first be supposed, as in the first part of the stroke the force is great, but when the water is once in motion, so much power is not required. The centrifugal pump does best with a low head of water, and it will hardly work at all with a high head. The mere act of putting a mass of matter in motion is not difficult. The waste is only when the force is used to move what is not required. In the Brooklyn engines the air pump is used as a spring to compress the air, and give back force to the water. In a well constructed pump the air barrel is very necessary. A reciprocating pump with an air chamber does not waste power. Any unevenness of motion can be overcome by counter-weights. Counter-weights when first used on locomotives increased the speed very much; fourteen miles an hour was the ordinary speed without them, but the use of counter-weights doubled the speed to twenty-eight miles. If the pump is placed below the water level, so that there is no vacuum formed, the water will flow quite readily into the pump, and a gain is thus attained. Much has been said about pumping hot water, and the difficulty of forming a vacuum on account of the vapor from the hot water, but he had seen water at 212 degrees pumped without any trouble whatever.

Mr. S. McIlroy stated that he pumped hot lye at a temperature of 180 to 212 degrees, but the only pump that he could find to do this was the Springfield pump.

Dr. Vanderweyde added that there was a device patented for the use of an India rubber diaphragm in the chamber of the air pump, but this is very often broken. He had contrived an air chamber for the exhaust, and another for the force pump side. After some further discussion, the Association adjourned.

## December 26, 1867.

Professor S. D. **TILLMAN** in the chair.

The Chairman presented the following notes on science and technology:

### TO DEODORIZE PETROLEUM.

An odor in petroleum arising from sulphur, may be removed by treating it with a solution of oxide of lead in caustic soda.

### TO PRESERVE PEGGED BOOTS.

The strongest and cheapest boots and shoes worn in this country sometimes fail, owing to the shrinking of the wooden pegs. A very simple remedy is to rub petroleum along the line where the upper leather is joined to the sole. When the pegs are saturated with this oil they resist the action of wet and dry weather.

### SARDINES.

Sprats, young pilchards, and other fish of the herring family, are put up in oil and sold as sardines in England. Mr. Couch, a Cornish ichthyologist, says the sardine appears to be the only fish of this family, except the pilchard that has the dorsal fin at the center of gravity. Cuvier, found no difference in the structure of those fish; the sardine being distinguished only by its inferior size.

### THE EGYPTIAN MUMMY.

Prof. Czermak, of the University of Jena, while examining the stomach of a mummy, found a roll of something, which, under the microscope, proved to be the skin of the soles of the feet. Further investigation shows that this disposition of the sole was a common practice, and it is supposed to be symbolical of the eternal separation of the dead from the earth.

### A SUBSTITUTE FOR DISTILLED WATER.

A correspondent of *The British Journal of Photography*, says, when in the wilds of Wales and Scotland, where it is difficult to obtain distilled water for photographic purposes, he boiled the purest river or spring water he could find, and, after adding to every ounce a quarter of a grain of nitrate of silver, allowed it to stand, and when cold, filtered. This solution met every requirement.

### NEW REMEDIAL AGENTS.

Mr. Wentworth L. Scott, in a paper read before the British Pharmaceutical College, at Dundee, suggests, that granulated charcoal be made the carrier of gaseous bodies suited for the treatment of certain forms of disease; but which, under all ordinary methods, are either impossible or very difficult to administer. The results of experiments he had already made in this direction, were very encouraging.

### WHITE PASTE.

*The London Photographic News* states that a good white paste, pure in color and adhesive to all surfaces, may be made as follows: A solution of two and a half ounces of gum arabic in two quarts of warm water is thickened to a paste with wheat flour; to this is added a solution of alum and sugar of lead, seven hundred and twenty grains in each water; the mixture is heated and stirred about to boil, and is then cooled. It may be thinned if necessary, with the gum solution.

### PHOTOGRAPHING CHILDREN.

Mr. H. J. Fellows gives, in *The Philadelphia Photographer*, a simple and effective remedy for the difficulty of obtaining sufficient time upon children's pictures. He heats the developer. To do this he turns up the edge of a quarter metal plate, so that it will hold just sufficient for one development, and then heats it over a gas flame. By this means he has frequently obtained a picture in ten seconds. It may perhaps lack softness and depth, but what can one expect from a child who will not sit still.

### THE CAMPHOR STORM GLASS.

Mr. C. Tomlinson, of London, after a series of experiments, arrived at the conclusion that the storm glass was not acted on by light, or atmospheric electricity, or wind, or rain, &c., but solely by variations in temperature; that is, it is a rude kind of thermoscope, vastly inferior to our ordinary thermometer, and has no meteorological value whatever. His position may be proved by dipping a piece of filtering paper into ether, and placing it on to a bottle containing a little camphor, &c., the cold thus generated will determine a deposit of crystals to any part of the glass at pleasure, and according to any pattern or device we may choose to give the filtering paper.

### TO CUT GLASS.

Broken glass may be utilized, and broken bottles be turned to useful jars, by a simple means of cutting glass, which consists in first scratching it with a diamond or file on the curved or straight line to be cut, and then tracing the line with an ignited pencil, made as follows: one-eighth of an ounce of gum tragacanth, dissolved in sufficient water to form a thick paste, is mixed with a solution of one-fourth of an ounce of powdered gum benzoin, in the least possible quantity of strong alcohol; to the mixture is added enough powdered beechwood charcoal, to form a doughy mass; this is rolled into little pencils about four inches long, and left to dry. Such a pencil will, on being ignited, burn to a fine point until it is entirely consumed. As contact with the glass tends to check combustion, it is essential to withdraw the ignited pencil every few seconds, and hasten its burning by brisk blowing.

### EFFECT OF ABSENCE OF SOUND.

Dr. H. Ralls Smith, of Louisville, Ky., by certain investigations, claims to have established the truth of the theory that animals living permanently in the Mammoth Cave of Kentucky are not only without a trace of the optic nerve, but are also destitute of the sense of hearing. At one time he penetrated about four miles into the interior of the cave, and some four hundred feet below the surface of the earth, the solitude and total absence of sound produced a very distressing and almost insupportable effect upon him, resulting in a very perceptible, although temporary, defection of hearing and aberration of mind. This explains the fact why persons lost in the cave for one, two, or three days, have always been found when rcsuced, in a state of insanity. The mind and special senses, deprived of their natural pabulum and stimulus, gradually become weakened, paralyzed, atrophied, and finally as far as external manifestations are concerned, nearly if not quite extinct. This fact may afford some clue to the cause of cretinism in the Alpine valleys.

### PRESERVING FRESH FLOWERS.

A correspondent of *The London Chemical News* says: Flowers may be kept in pretty fair condition, say for a week or ten days, according to the species selected for bouquets and the time of the year, by renewing the water every alternate day, and while doing so, rejecting the decayed flowers and leaves, and taking care to cut from the stems immersed in water, with a sharp pair of scissors, about from a quarter to half an inch of the length; then should be added to the water about a pinch of salt and a few grains of saltpeter for every pint of fluid; when flowers are very much faded they may be revived by immersion of the stems for two or three minutes in hot water, or, better yet, in strong spirits of wine or Eau de Colgne; in some cases liquid ammonia may be advantageously applied to the stems for a few minutes to revive the flowers. These recommendations are applied by several of the largest horticulturists of Ghent, and other parts of Belgium, and found to answer in practice very well if properly applied. To keep well, flowers should not, after being cut, be placed in localities where there is tobacco smoke, or bad ventilation; neither should the rooms be too much heated.

Quite an animated discussion arose on the reading of an item as to the effect of charcoal taken into the stomach. Some maintained that it was beneficial and others that it was injurious. The Chairman said a married lady of his acquaintance (the wife of an allopathic physician by the way), was accustomed to eat large quantities of charcoal made from pine wood, which she prepared herself. She had pursued this practice for many years, and without experiencing any ill effects.

Dr. Parmelee said this was an exceptional case, such as the man who eat clay for many years, and the one who eat stones, but such instances do not prove the practice healthy. The objection to charcoal is the hard and gritty nature of its particles.

Mr. T. D. Stetson spoke strongly in favor of the purifying properties of charcoal.

## *EFFECT OF ARTIFICIAL ILLUMINATION.*

Under this title, Dr. Adolph Ott read a paper showing the actual quantity of carbonic acid gas generated by different kinds of illuminating substances. It had been found by experiment, that in producing a given degree of illumination, rapeseed oil produced the least, and kerosene the greatest quantity of this gas.

## *ANTIMONY.*

Dr. Feuchtwanger read a paper on "Antimony;" after which a long and exciting discussion took place as to the medical virtues of that metal, which received its name from its fatal use among early monks—and from *anti-monk* came antimony.

Dr. Adolph Ott remarked that the statements which have been made regarding minerals containing antimony reminded him of certain facts which may be mentioned here. The telluriate of silver and gold has recently been found in California. It had heretofore been only found in Transylvania. The sulphide of tellurium and the sulphide of antimony, also the sulphide of silver, were combined with gold in a metallic state.

Dr. P. H. Vanderweyde said, antimony as a medicine is almost as dangerous as mercury, and should be used with caution. The tartrate of antimony is the most dangerous; it has the property of reducing the pulse. One grain is fatal, and it has to be used in portions of one-twentieth of a grain or less. It has an accumulative effect; it does not manifest itself at first. After giving it for some time, without any perceptible action, it will all at once produce the most alarming symptoms. The tartrate of antimony, when used as a salve, produces sores that can never be healed.

The Association then adjourned to the second week in January.

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## January 9, 1868.

Prof. S. D. TILLMAN in the chair.

The following notes were read by the Chairman:

### A SERMON METER.

The Queen of Great Britain has fixed on the pulpit of the Chapel Royal, Savoy, a sand-glass measuring eighteen minutes.

### NEW USE FOR MAGNESITE.

Dr. Swartz recommends the use of magnesite, a natural carbonate of magnesia (*magmarit*), for obtaining the carbonic acid required in soda water. The gas, obtained by subjecting this mineral, in a retort, to a red heat, is pure and odorless, and the resulting magnesia will be found more valuable than the original material. But the supply of magnesite is not large. At Hoboken, New Jersey, it is found in small seams with dolomite and serpentine.

### NEW TREATMENT IN CASES OF AMPUTATION.

Dr. Maisonneuve, surgeon of the Hotel Dieu, Paris, read a paper before the French Academy on the advantages of a continuous method of aspiration in the healing of great amputations. The liquids exuding from the surface of the wound coming in contact with the air, poisonous putrefaction ensues; to arrest this action, Dr. Maissonneuve, after dressing the wound with lint saturated with antiseptic liquids, brings into use his aspiratory apparatus, which consists of a sort of a burrette of India rubber furnished with a tube of the same substance, a flash of three or four litres capacity, and an air-pump which exhausts by means of a flexible tube. By the use of this apparatus he removes the principal cause of danger from amputations.

### HINGE MACHINE.

The machine for making wrought-iron and brass-butt hinges, invented by Messrs. Evrard and Boyer, of Paris, France, has lately been brought to this country. Sheet iron or sheet brass is employed of proper thickness. The hinges are made complete for market in one single machine. Two strips of metal enter the machine on one side from coils; on the opposite side is placed a coil of commercial wire, which enters and forms the hinge rivets; the screw holes and countersinks all being made in one operation. One hundred hinges of the smallest size leave the machine per minute, in a condition to be packed for market. One machine will make five different sizes of butts—four-inch hinges being made at the rate of from twenty-five to thirty per minute.

### LIGHTING GAS BY ELECTRICITY.

Mr. Samuel Gardiner has just placed his electro gas-lighting apparatus in the picture gallery of A. T. Stewart, Esq., it being a part of the magnificent mansion which he is soon to occupy on the Fifth avenue. The number of burners is three hundred and twenty-five. The room was instantaneously lighted on the evening of the 19th ult., and was decided by Mr. Stewart, Mr. Kellum, the architect, and others present, to be a perfect success. From the street the view was magnificent, the reflected light being seen at the distance of several blocks. On turning the gass off and on, the effect was like that of repeated flashes of lightning. In the Gardiner machine each burner is lighted by means of a platinum wire, made red hot by means of an electric current.

### COPPER AMALGAM.

This amalgum, used in the reproduction of etched and engraved plates, is made by mixing mercury and pure powdered copper in a small quantity of nitrate of mercury. Lowe obtains powdered copper by adding to a saturated solution of sulphate of copper (*cupmazot*), an equal quantity of hydrochloric acid (*thalad*), and placing in the mixture thin strips of zinc, when hydrogen gas is evolved and a porous mass remains, which falls into powder on being shaken. This powder, after being washed, first with hot water and then with pure alcohol, consists of particles of copper, quite free of any oxyd of the metal. Powdered copper may also be obtained by subjecting the black oxyd of copper, when heated in a flask, to a stream of coal gas, carried in and out by means of two tubes placed in the cork.

### NEW METEOROLOGICAL INSTRUMENT.

Prof. De la Rive, of Geneva, Switzerland, has invented an instrument for determining the transparency of the atmosphere. It consists of a double telescope with a single eye-piece, by which two objects at known distances may be compared. Thus the effect of the stratum of air between them may be noted. The inventor thinks that a measure of transparency may be of great importance in a sanitary point of view. He agrees with Pasteur, who supposes that the light dry fog which sometimes intercepts the light is caused by myriads of organic germs floating near the earth, which become transparent when saturated with moisture, and are swept to the earth by heavy rains. Vaillant, however, believes that the haze sometimes seen in fine weather is the effect of variations in the density of the atmosphere, for reflected light, passing through such a medium, would not give a distinct impression of distant objects.

### NEW USE FOR TEAK OIL.

The ravages of white ants in the wooden supports of the Indian railways have been a very serious evil. Sleepers have been boiled in poisonous solutions, and coated with coal tar, but such processes were of no avail against the attack of these insects. When once embedded in a sleeper, the vibrations to which it is subjected by locomotives and cars passing over it, do not check the operations of the ant. The Goverument of Madras has offered a reward for a remedy. Mr. Brown seems to be the only one who has found a preventive. It is the oil extracted from teak chips, which can be obtained in any shipyard where this wood is used. They are placed in an iron pot, having a hole in the bottom, which is set upon another iron pot; both are placed in a hole in the ground, and a brisk fire is made on the top. When the chips have become charred, a quantity of strongly scented oil will be found in the lower pot, which makes a good varnish. Any timber varnished with it will not be touched by white ants.

### SHODDY.

In 1813, the first attempt was made in England to utilize such waste materials as soft woolen rags, worn-out carpets, flannels, guernseys, stockings, &c. Afterward the shoddy machines were so modified as to utilize what is called "mungo," which consists of threadbare broadcloths and clippings of other woolen cloths of fine quality, and is brought from all countries where such clothes are worn. At present shoddy forms about one-fifth of the weight of the woolen and worsted manufactures of West Ridings. Shoddy and mungo, mixed with wool, are made into cheap broadcloths and material for ladies' caps and mantles, for petershams, pilots, pea-jackets and blankets. They enter into the composition of felted cloth used for overcoats, carpets, table covers, etc. It is said the trade could not be carried on without shoddy and mungo; and that the amounts consumed yearly range from 70,000,000 to 80,000,000 of pounds.

### IMPROVED PROCESS FOR MAKING BEET SUGAR.

Carmichel & Co., sugar refiners and distillers, in Four-du-pin, France, have had in successful operation for several years Dubrufant's osmose apparatus for filtering sirups, in which, for a part of the usual quantity of bone-black, is substituted sheets of parchment paper, that is, paper which has been toughened by being dipped in a solution of strong sulphuric acid. Fifty or sixty sheets, stretched on frames, are placed one-half an inch apart, thus forming a series of narrow cells, which are alternately filled with sirup or molasses and with water, so that every cell filled with sirup has water on both sides of it. Each cell has two openings, one below for the entrance of the liquid, and one above for its exit. The liquid is heated to about one hundred and seventy degrees Fah., when the osmose action or impulse by diffusion through the parchment paper commences. Every two days the operation is suspended to clean the apparatus, first with hydrochloric acid and then by a steam jet, which takes about four or five hours. The success of the whole operation depends entirely on the most scrupulous cleanliness. One man and a boy will keep a large number of cells in operation, as all they have to do is to regulate the supply of liquid by means of stop-cocks. The expense of labor, parchment, and a small amount of bone-black is about five francs per one hundred kilogrammes, or less than half a cent per pound of sugar. Mr. Carmichel declares that the expectations of the inventor of this process have been more than realized, as from eight to ten per cent more of sugar is extracted than by the old bone-black process, and the general adoption of the parchment paper plan would immensely increase the production of the article. The total amount of sugar manufactured annually is not less than 2,800,000 tons. It is obtained principally from four different sources, in about the following proportions:

| | | |
|---|---|---|
| Sugar cane | 2,000,000 tons, or | 71.42 |
| Beet | 630,000 tons, or | 22.50 |
| Palm | 140,000 tons, or | 5.00 |
| Maple | 30,000 tons, or | 1.08 |

### MECHANICAL PROPERTIES OF STEEL.

William Fairbairn, F. R. S., communicated to the British Association the results of a laborious series of experiments to determine the comparative merits of different kinds of steel as regards their powers of resistance to transverse, tensile and compressed strain. In order to arrive at correct results, he applied to nine of the first manufacturing firms, including Bessemer & Co., for the fifty-two specimens experimented upon. The experiments commenced with the transverse strains, which were conducted, as on former occasions, by suspending dead weights from the middle of the bar, which was supported at its extremities, the supports being four feet six inches apart. Immediately over the center of the bar, at a point equidistant from the supports, a wheel and screw was attached to a scale, on which the weights were placed, fifty-six pounds at a time. After each weight laid on, the deflection was taken, and the experiment was continued until a permanent set was obtained. The permanent set was observed at intervals in the following manner: After the deflection produced by the load had been ascertained, the screw was turned so as to raise the scale and relieve the bar of the load, thus enabling the experimenter to ascertain the effects of the load upon the bar and register of the permanent set. The results of the experiments on transverse strains show that within the elastic limits the deflections are in proportion to the pressures. The bars generally exhibited very high powers of resistance to transverse strain, the mean value of the unit of working strength being six tons. It was next shown that taking eleven tons per square inch as the mean value of the compressive and tensile resistance of wrought iron at the elastic limit, the value of the unit of working strength is less than two tons, and thence it followed that the transverse strength of these steel bars will be about three and a half times the strength of wrought iron bars of the same dimensions. He determined the relative value of these two materials, taking the cost of iron at thirty-five dollars per ton, and steel at sixty dollars, and found that iron would be about one and a third that of steel. In the case of railway bars, and such constructions, besides this saving in the cost of material, it must be borne in mind that the steel rail would last four times as long as the iron rail.

Taking the mean results of the experiments on thirty of the best specimens with regard to tensile strain, he found the mean tenacity per square inch equal to 47.7 tons. Taking twenty-five tons per square inch as the tenacity of the best English hammered iron, it follows that the tenacity of the steel bars is nearly twice that of iron bars.

The results with regard to compression, show that thirty-two of the bars supported a pressure of 100.7 tons per square inch, while twenty-three bars were more or less fractured by this pressure. The mean value of the unit of strength in short columns is 33.4. It was calculated that the work expended in rupturing the material by compression, is about five and a half times that expended in rupturing similar material by extension. The resistance to compression was found to be more than double that to extension; hence it follows that the most economic form of a steel bar undergoing transverse strain would be a bar with double flanges, having the area of the bottom flange about double that of the top flange.

Mr. D. W. Bradley read the following interesting paper on

## *THE TOWER CLOCKS OF NEW YORK CITY.*

*Mr. Chairman:* While inviting you to take a tour among the towers with me this evening, I can assure you I feel my inability to make that tour interesting; my descriptive powers are limited. Some time since I jotted down a general description of the tower clocks in New York, with some facts and fancies concerning them, and I propose to give you them very nearly as I jotted them down, although in copying I did try to work out some of the fancies. So, if you find anything in this foreign to the subject, I must beg you to forgive me, as it was written and intended only to occupy a space in a private diary.

My first thought is the old saying of Franklin, that "Time is money." Now, with all due deference to the great philosopher, I would say, Time is education. Time is improvement, progress, science, art; and, on the other hand, time is idleness—time is dissipation, poverty, ruin, decay. But as for "time being money"—why, I have been experimenting this thirty years, and never could make it yield more than bare enough to keep soul and body together.

Our forefathers counted time by days; our fathers, by hours; we, by minutes and seconds. Our grandsires traveled by sail, and started on a certain day, or the next; our sires, by stages, that left at a given hour, or when they got ready; we, by steam, on the minute. Our grandparents thought a clock a luxury; our parents were proud, that possessed a watch. We all carry watches; and if we take a "turn on the road," with any kind of a nag, we must have our independent seconds, while our Bonners and Beechers go by fifths or tenths.

In the absence of a standard public observatory, we get nervous and fidgety about the time, and when Blowhard Brothers announce, through the daily Trumpet, that all of the railroads and steamboats in the universe run exclusively by their time, we rush headlong to compare with the great oracle.

We have a few private observatories in the city. A few gentlemen take the time for their own amusement; a few for their own convenience. All others have either to buy, beg or steal. Most of the buyers are supplied by Prof. Bull, who is very careful and painstaking in his observations, and supplies at a reasonable price. He also gives the time to the New York and New Haven, Harlem, Hudson River, Erie, New Jersey Central, and other roads. As the regulators kept for rating chronometers are seldom at just mean time, but varying all the way to a minute, the beggars do not fare very well; for if they come too often, they become bores, and get short and uncertain answers. The stealers seldom get the exact seconds, but are the noisiest pack of the whole.

To Messrs. Hammond, Powan, & Bull, I feel under obligations, for I have never asked either of them a question concerning time or time-keeping, but that it has been answered with a promptness and candor very gratifying.

To commence our tour among the towers: We will go up St. Paul's. I have a key, but as it weighs near a pound, I oftener leave it at home than carry it, and always find John missing at the same time my key is. But we are in, and up, up, we go. Everything looks old and antiquated. The dust of a century lies about us. The stairs are worn and decayed, and now and then a step gone. Take care that, in going up on your feet, you do not come down on your head. This bell was new about a year since. The old one got cracked, and they set a man to boring the crack out. He worked a week or two, or until he nearly froze to death; and when he had done, to their great surprise the crack was larger than before. So they put in a new one.

Here we are. An old rusty key, with a kink like a pig's tail, lets us in. I have not a particle of sentiment in my composition; yet I invariably greet the old clock with: "Good morning, old fellow! how have you been?" Sometimes I think I hear an answer: "Hale! thanks! For seventy years, in sunshine and in storm, I have faithfully given warning as the hours passed by, but my foot-falls on the pathway of time must soon cease!"

The inscription reads: "John Thwaites, Clerkinwell, Lond., 1798."

The frame stands five feet long, two feet three inches wide, and four feet high. The four columns at the corners have connecting bars near top and bottom, tenoned into them, and screwed firmly together. Bolted to these cross-bars are three upright bars on each side, which hold all the working parts; the time train of four wheels on the left, the strike train on the right, and the dial and locking parts in the center. The main time wheel is twenty-four inches, the strike twenty-seven. The scape wheel is eight inches, and toothed. The pallats are dead beat. The pendulum is of wood, thirteen feet, and giving thirty-two beats. The ball weighs about seventy-five pounds. It regulates from the bottom like a common clock. The pinions are lantern, made by driving on the arbor two heavy collets, and cutting in them as many slots as there are to be leaves. Steel bars are laid into these slots, a band driven on to keep them in place, and they are then finished or rounded to suit the fancy of the artist.

The train wheels are all of brass, the winding wheels of iron. The brass work is well finished, but the iron parts are just as it came from the hammer. The arbors are only turned at the collets and bearings. The arbor bearings are brass bushings. The barrels are fifteen inches diameter. The time weight is wound by a pinion and crank, but the strike has a ship's wheel set so that it can be coupled on to the arbor, and the winding embodies my ideas of hard work. The movement is about six feet above the dials. The dial works are sadly worn; in some parts they hardly mesh at all. The striking has the old rack and snail, lifts the hammer from the second wheel, and at each blow it rattles and jingles as if it were all falling into one confused mass.

St. John's clock was built by Henry Harris, Curtain Road, London, 1812.

It is almost identical with St. Paul's, excepting it is better finished in some respects, and has the worst escapement I ever saw. The scape wheel teeth are very long and slim, the impulse angle near sixty degrees, a dead drop of near one eighth, and to finish, a short pendulum of seven and a half feet, it gives the pallats a blow as it escapes, that shakes the whole movement. Nearly every tooth in the scape wheel has been broken out; I have put in five new ones. The weight is too heavy; but being a solid casting, cannot be reduced, and if like St. Paul's, a large amount of the power was not lost by the vibration of the pendulum spring, I cannot say where it might spring to. The scape wheel teeth slide on the pallats an inch, and yet the curve is so perfect that I cannot perceive one fraction of motion in the wheel.

We now come to two clocks built by Stokell—the Dutch Reformed, Fifth avenue and Twenty-ninth street, and St. Mark's. The first is copied literally from St. John's, excepting the escapement, and the same may be said of the other, only it is reduced in size. In both he gave a slight recoil to his pallats, which deadens the motion, and keeps them within bounds. Stokell made some of the finest and best regulators we have in the country, and it seems strange that he should copy two clocks from one known to be bad. I know you are getting tired, and it is a long walk, but I cannot describe things just as I would like to, without going all the way down to Trinity Cathedral.

Trinity, as Mr. Rogers well remarked a short time since, is the heaviest clock in America. He seems to have made an effort to see how much metal could be put in a clock. The frame stands nine feet long, five high, and three wide. The main wheels are thirty inches. There are four wheels in the time train, and three each in the strike and chime. The scape wheel is nine and a half inches. The pallats are dead beat, rounded impulse, and well jeweled; all the pinions are lantern. The barrels are twenty inches, turning three times in twenty-four hours. The winding wheels are a solid casting, thirty inches diameter, and two inches thick, and are driven by a pinion and arbor. On this arbor is placed a jack or another wheel, pinion and crank, and it takes eight hundred and fifty turns of this crank to turn each weight up. It takes seven hundred feet of three-inch rope for the three cords, and over an hour for two men to wind it. The retaining power is operated by hand. Two arms project from an arbor, on one of which is fastened an iron bell, weighing about twenty-five pounds, and the other has a knuckle-joint and finger, that when it lets down, takes into the teeth of the second wheel, and carries it forward, but passes the teeth freely when brought back. The pendulum makes twenty-five beats, and is about eighteen feet long. It has the regular striking train. The lifting pins in the second wheel, the gathering pin on the third arbor, and the locking bar and fly on the fourth. The mass of cams, levers, star wheels, &c., that he manages to get in to give the inside time, carry the snail, and do the unlocking, I will not attempt to describe. It is so dark that we cannot see anything without candles, nor find anything with.

The chiming train is the same as the striking excepting that in place of pins in the second wheel it has three pin wheels placed on the arbor for operating the three levers; on this arbor is also placed a cam with four slots, so divided that at the first quarter the train runs long enough to strike two before an arm drops into one of these slots and the train locks. At the next quarter it strikes four, the next six, and the next eight. This completes the circuit, and it commences anew.

These levers are not operated in regular order, but always commence with 1. Thus, at the first quarter it lifts 1, 2, the next 1, 2, 3, 2, the next 1, 2, 3, 2, 1, 2, and the last quarter, 1, 2, 3, 2, 1, 2, 3, 2.

Above the main wheels the movement is contracted in width to two feet, thus shortening all the arbors above to that length. The main arbor bearings are two inches diameter, the scape wheel three-quarters of an inch. I cannot think Mr. Rogers had a correct idea of what he was going to do when he commenced it, for when put up it would not run seven days, and he had to put in new main wheels. The most stupendous blunder of all was putting it forty feet above the dials, and the laugh comes in when he says that he wanted to put it below the dials, but the architect would not let him, while the architect declares he wanted to have it put below, but Mr. Rogers would have it above. However, the clock was finally finished and an agreement made with the sexton's son that he should have twenty-five cents every time it stopped, by giving information. As it stopped nearly every day, and often three or four times, the boy had a fat thing while it lasted; but it was soon put into other hands, a new scape wheel put in, and other alterations made, so that it run very well; but it had got a bad name, that clings to it even to this day. The connection between the dials and movement is a four-inch tin pipe. Instead of putting the dial works at the dials he put them in the center of the tower, and run a four-inch tin pipe to each hour hand, and a three-inch one inside to the minute hands, with a band of friction rollers between them. The dials are eight feet. There is power enough on this movement, if properly made, to carry four twenty feet dials, but it is so used up in bad pitches, large bearings, heavy wheels, and friction generally, that it is only by constant nursing that it keeps moving. Thanks to a long, heavy pendulum, it does keep very fair time, and has run for months during the past summer without any alteration, and its greatest variation has seldom been more than ten or fifteen seconds in a week, and sometimes banking on the wheel at that. The weights I judge to be about eight, twelve, and fifteen hundred pounds, and drop fifty feet. A large box is placed at the bottom of the wells that holds about a bale of cotton waste, so that if a cord should break, the cotton would check the blow. Two years since I wound it on Saturday, and on Sunday morning the chiming cord broke, and the weight of 1,500 pounds dropping fifty feet made the splinters fly in all directions. The cotton box was strongly braced on all sides, but it spread open and at the same time the weight box burst and spilled its contents, otherwise there might have been an extra weight on the organ bellows which are in line below. Sand boxes break the force of a falling weight better than anything I know. This clock bears the name of "James Rogers, 1846." The clocks we have visited are all English. But you say three of them were built here. So they were, and so do Englishmen brew their ale here, and English women make their plum-puddings here, and though it is not at all like that they 'ave at 'ome, it is English for all that. When an Englishman builds a clock he must have ponderous heavy main wheels and barrels. No matter how fine he may run up his train, these must be massive, weighty. A clock could be built to do all and better service that Trinity does, from the metal in the frame and main wheels. The pinions are all made from the good old English rule, that the circumference of a twelve-leaf leading pinion must equal fourteen teeth on the wheel. The tooth strikes entirely too soon, some of them so much so that unless kept oiled they will not slide into mesh, and I defy any man to make a tower clock keep time with oiled pinions. On the other hand, the driving pinions, which should be in proportion larger, are made smaller, and in some of the winding jacks the leaf strikes the tooth nearly on end. The pitches all through continually remind me of the donkey—

> "Who made unto himself a law
> That he would neither be drove—nor draw."

As different authors use the terms "driving" and "leading," as applied to pinions in a different sense, I will add that I have been accustomed to and still call a driving pinion one that carries a wheel forward, and leading one that is carried forward by a wheel.

Neither of the clocks mentioned keep fine time. Trinity does the best of the five, the Dutch Reformed next. The others are like the white man, "very uncertain." Trinity, St. Paul's and St. John's are very erratic in their motions, sometimes barely escaping, and act as if just giving their last dying kick and confession, and then again banking against the wheel as if determined to clear the way of all obstructions. This is easily accounted for. Clock trains, with the imperfections I have mentioned, run in a dry, clear atmosphere with about one-quarter less power than when it is damp and muggy. The weights are heavy enough for all emergencies.

During the late heavy snow storm, the north window in the clock room at St. Paul's got open, the movement got partially covered, and it drifted down into the pendulum box until up to the top of the ball, yet the old clock waded through it with all the glee of a school boy, and the pendulum stowed the falling snow away on this and then on that side, and pelted it with such pertinacity that by the next morning it had got fifteen minutes ahead of time. The very first warm, muggy day after, it stopped—fainted.

I hope none will think I have used the term English in a manner unworthy of a descendant. I have spoken of Englishmen, as a rule, as a class, as a nation. Exceptional Englishmen (and there are very many of them) do cut aloof from these snobbish notions; do come out into a higher strata of thought and ideas, and do make some of the finest and best clocks the world ever produced; and certainly no more thorough, practical or elaborate work has been written on any branch of mechanics than Thomas Reid's Treatise on Clock and Watch Making, originally published about 1823, and gone through six or more editions. I admire the candor with which he discusses the claims of others to old inventions, and his seeming well content with the glory honestly earned by his countrymen, without grasping for those of his German, French and Italian co-laborers.

I think you are rested by this time, and we will continue our tour. I very much regret I have not one German clock to show you. There was one in the post-office, and may be there yet, for aught I know. Some time since I asked permission to go up and see it, and was answered with a growl that it was taken out long ago. There is one out in New Brunswick like it, but not having seen cannot describe, and all I know is that they only had one hand that gave the hours. The next clock we come to is Yankee. Not very pure breed, perhaps, but still Yankee.

Old St. George's was made by Simeon Willard, Roxbury, Mass. There is no date, but as the church was burned in 1814, and rebuilt in 1815, we may infer about fifty years since. It is smaller than the others, the frame being five feet long, two wide, and three and a half high. The main wheels are twenty inches, and all the other parts thrown in between them and curiously mixed up. The scape wheel is seven and a half inches, toothed and recoil pallats. The pendulum is simply an iron rod, five feet long, with a spherical iron ball, of about fifty pounds. There is no attempt at compensation, and yet no clock in the city more than ten years built has gained such a reputation for time-keeping. Twenty years since a person who had not St. George's time was supposed to have no time at all. It has a good motion, recoils largely, is very steady in its gait, and no doubt runs as well as in its palmiest days. I think its great reputation was gained before people were so exacting in regard to time as now. It is the first to strike from the main wheel. As the old is soon to be pulled down, no care is taken with it inside or out, and the dials are so obliterated that the time can only be guessed at. If you are not in too much of a hurry, we will get the inscription on the bell: "Presented by Thomas H. Smith, Esq., to the Corporation of St. George's Church, New York. T. Mears, of London, Fecit, 1818."

At the City Hall we find the first really good clock. The frame stands seven feet long, two feet three inches wide, and five and a half high. The main wheels are twenty-eight inches. Like the others we have seen, it has four wheels in the train. The scape wheel is very small—four and a half inches, and has fifteen pins. The pallats are jeweled with agate. The pendulum is fifteen feet, vibrating in two seconds. Joined at the top, and running down on each side, are rods of seven-eighths inch iron. These are spread to thirty inches at the bottom, and have each a stirrup at the end. A bar of one inch brass, and one-half inch steel, is laid in these stirrups, the brass side up. On the center of this bar the ball rests. The center rod is a piece of tubing, and runs into the ball to hold it in position, but is not attached to it. The ball weighs three hundred pounds. The contraction of the iron rods which would draw up the ball, are met by the greater contraction of the brass letting it down, and when the rods expand, the greater expansion of the brass lifts it up—only it don't, or at least has not done so yet. I run this clock from June 1, 1866, to February 1, 1867, without moving the hands; but after that, until settled warm weather, I had to set it every week, although the variation never exceeded thirty seconds. Last summer I could not seem to get a steady, uniform gait on it, but it ran three months inside of fifteen seconds. It runs very freely with a very light weight, and the pendulum has not lost one vibration in over two years from any cause. Wire rope of copper, one-fourth inch diameter, is used. All the fittings are first class; there are no intricacies about it; every part can be seen at a glance. The adaptation of wheel and pinion is so near perfect that the point of contact or pitch line is only about one-eighth inch wide, which, on wiping off the dust, shows no signs of abrasion; it is not even brightened on the main wheel. The dials are six feet in diameter, and about fifteen feet above the movement.

I have a clock to wind in the Aldermen's Chamber; let us go in, and while I am winding, you look about. Do you see that fine fatherly looking man to your left, who stands leaning against his horse? Don't you think he looks pale, as if from loss of blood? Scrutinize him closely. Do you see that both his legs are cut off? Do you see this empty panel, and that? There stood John Jay, and there Alexander Hamilton, both patriots, both men of the times that tried men's souls. Alas! both were cut in quarters by the assassin's blade, and both taken away and laid, we know not where. As we turn again to gaze on the man who never was born to die by a bullet, we see, that although standing there for two years, with both legs off, his countenance still bears a look of calm resignation. Oh! that those men with their long glasses, who are spying out God-forsaken souls among the wilds and jungles of India, would for once contract their horizon to the region of the City Hall, and see, if among our free and enlightened citizens, they could not spy out the man who cut the legs off the Father of his Country.

The new clock at St. George's, in Sixteenth street, I think, is the simplest I ever saw or read of, and I feel certain that none have excelled it in finish. The frame stands eight feet long, three wide, and seven high. The main time wheel is three feet diameter, has one hundred and eighty teeth, turns once in twelve hours, has the figures on its face, and a pointer gives the hour. The second wheel is twenty-seven inches, has three hundred teeth, revolves every hour, has the minutes on its face, and a pointer giving the time. The third and scape wheel is eight and a half inches, turns once in three minutes, and has the seconds pointed off. The pinions all through, in both trains, have fifteen leaves. The scape wheel has thirty pins of a new design, to prevent the oil from flowing on to the wheel, and leaving the pins dry, a source of much annoyance in all former pin escapements. The pallats are jeweled with agate, and both pins and pallats have the greatest attainable polish.

The pendulum is thirty-five feet long, and vibrates in three seconds. The rod is two and a quarter inches diameter, and made in sections of five feet, and secured by bands and screws firmly together. The ball is four feet long, by seven inches diameter, weighing three hundred and ninety pounds. This rests on a column of zinc, with a little copper added, and furnished with set screws, so that it can be adjusted to compensate from any portion of its length. The weight on pendulum spring is about five hundred pounds. The snail is secured to the main arbor, the lifting pin to the second wheel. The retaining power is self-acting, and operates the same as in the English lever watch. The pallats are held in position by a set screw, and to set the train, needs only to be pushed back out of gear. This arrangement of wheels and numbers precludes the necessity of any dial works on the movement, and we get all the operations required by three wheels and two pinions. Perhaps it will be better understood by going over the train the other way. Thus the pendulum vibrates in three seconds, allowing a pin to pass the pallats in six seconds. As there are thirty pins, the wheel makes one revolution in one hundred and eighty seconds, or three minutes. The pinion has fifteen leaves, and turns twenty times in an hour; therefore the next wheel, to turn once in an hour, must have twenty times fifteen, or three hundred teeth. The next pinion having fifteen leaves to allow the main wheel to pass around in twelve hours, it must have twelve times fifteen, or one hundred and eighty teeth. It seems to me we could have nothing simpler than this. Trinity has ten wheels and five pinions to do the same work. Trinity sends for Sam to tell Jim to ask Jo to unlock that striking. This lifts a finger, and 'tis done.

The strike main wheel is also three feet in diameter; has one hundred and sixty teeth, and thirty-two pins, with tempered steel rollers for lifting the hammer. The second wheel is twenty-seven inches, has two hundred and seventy teeth, and turns once to three strokes of the hammer. It has three pins in its face, and a pawl, that drops by its own weight, is attached to the frame, to prevent its going back while winding, as the pins always stop in the same relative position. A collet, in which is placed three gathering pins, is put on the second arbor, to bring in the rack while striking. The third arbor has a locking bar attached, and also runs through the frame, and has the fly of four fans on the outside. The lifting arm, operated by the pin, unlocks the train and holds it until the moment of striking; it also unlocks the rack which drops into position against the snail. When the train is let loose, it runs until the rack is drawn in, when it locks until the next hour. One blow is struck to every tooth of the rack drawn in, while the snail allows as many to pass out as there are hours to be struck. Both barrels are twenty inches in diameter, and grooved to receive a wire rope three-eighths of an inch in diameter. The train wheels are of brass, and pinions of steel, engine cut. All the teeth are rounded at the bottoms and finely finished. The winding wheels are of iron, thirty inches diameter, and are driven by a pinion and arbor and crank. It takes about twenty minutes to wind. The time weight is three hundred pounds. Power exerted on movement, one hundred; striking weight, seven hundred and fifty pounds; direct weight, one hundred and fifty pounds. The weights drop forty feet. The clock stands in the south tower, twenty-five feet below the dials. A bevel wheel is put on the second arbor, with ninety teeth, driving another of one hundred and twenty teeth, on a vertical rod that runs as direct as may be to a point in the center of the tower, and on a level with the center of the dials. Here stands an iron frame, in the center of which, and connecting with the vertical rod, is another bevel wheel with one hundred and twenty teeth, and around, three bevel wheels, each of ninety teeth, from which rods run to the several dial works. Some one may ask, "Why use bevel wheels of different numbers?" It would make no difference, until we come to branching off from the center to the dials. We cannot surround one bevel wheel with four others of the same numbers, for they would all mesh into each other. The starting point usually turns once in an hour, so we slow the train to this point, and then bring it up again. These rods are fitted with ball and socket joints, or a piece of tubeing at one end, and a ball nicely fitted to its interior at the other. The ball has a pin run through its center, and the tube has a slot an inch long cut in its end to receive it. This allows of a slight deviation from line, and gives us what is quite as essential—any amount of inchase, with certainty of action. If much deviation from line is required, we use the universal joint. Every ten or fifteen feet, a short piece is set in a frame and made permanent. For the north tower, the power is taken off by a pinion from the main wheel. The first rods run down forty-five feet, thence across to the other tower sixty feet, and then up to the dials seventy feet, making the distance, from movement to dials, one hundred and seventy-five feet. The center between the towers will rest on the organ, where a six-feet dial is also to be placed, making seven dials in all. If these connections are properly put up, they will carry very easy, and last as long as the rest of the clock, besides allowing a movement to be put below all vibrations of the tower.

A duplicate of this clock is now being put up at Rock Island, in the new arsenal our Uncle Samuel is building there. It will carry four twelve-feet dials. The dials are of stone, built in the tower, which is large—about thirty feet square at the dials, I think. I hope they may prove a credit to our city, as well as to their designer, my very worthy friend, Mr. A. S. Hotchkiss. The clock that was destroyed by the fire at St. George's, had run eighteen months without having the hands changed. I set the new one, about November 1st, three seconds fast. It has not been altered since, and to-day it shows very good running, I think, it being hardly regulated.

The clocks in the Brick Church, and St. Theresa, are small but well made, and if well taken care of would keep good time. They are cared for by the sextons, and get no care at all.

I have a few words to say about the clock exhibited at the late fair, if only to correct the impression among many that Remontoir is the name of an escapement. A Remontoir can have a pin, Graham, Detached, Chronometer, or any other kind of an escapement. This was a complicated affair, but Crane never made an escapement but what was. The idea was taken from Harrison, and the same line of thought runs through all of Crane's work, and he seems determined to fight it out on that line if it took a lifetime, but eternity came before he had succeeded in making a good escapement. His favorite hobby was transmitting power by a ratchet going backwards and operating two pawls alternately. These pawls were attached to opposite sides of a small wheel on an arbor, thus getting up an oscillating motion. To this arbor he attached either his motive-rod for a pendulum or handle for a striking hammer, which he would sometimes make ten feet long. The escapement in the clock at the fair, was one of his modifications of this principle, and the strike had it in full. This striking gives a good solid blow, but he never made one that would count twelve without hesitating. His year clocks were a great curiosity. He was a great genius, but he never made anything practical. His ingenuity seemed more like that of a child than of a well matured brain. Men of genius, whether in art, literature, or mechanics, stamp their productions with their own image, and any one at all accustomed to Crane's works would recognize this, even though it bear the name of C. A. Stevens & Co.

The simplest Remontoir I have met is at the store of Messrs. Blunt & Nichols, Water street, and can be seen by any one who will take the trouble to call. The train ends with a fly of two fans outside the frame, the same as in any ordinary striking train. On the opposite side of the third wheel is another pinion with twice as many teeth as the fly pinion. The scape wheel arbor is on a line with this and is connected to it by a fine coiled spring. It has the common pin escapement. The scape wheel arbor runs through the frame in a position that a small steel projection on each fly just strikes its center. Transverse slots are cut in the end of this arbor so that every quarter turn brings a slot in position that allows the point on the fly to pass through; make half a turn and the next fly rests on the arbor until a slot comes into position and allows it to pass. Everything about it is simple and easily understood. In driving the fly half a turn it winds the coiled spring one-quarter turn, and this power is given off to the scape wheel arbor. I can see no advantage in a Remontoir, except perhaps in a clock having very large dials in an exposed situation where a surplus of power might be needed in heavy weather, and even in that case, it must be borne in mind that a half minute of repose during a freezing sleet might prove fatal where a continuous motion would live through. The first Remontoirs were made about the year 1600, or fifty years before pendulums were used on clocks. In two hundred years they were made with every conceivable modification, rewinding from one to eight times in clocks, and in watches and marine chronometers, all the way to three hundred times a minute, but have been very generally discarded as a useless appendage.

The hobby of compensation has been ridden until seemingly unable to go one step farther. Almost every ingenious mechanic in the past two hundred years has been astride of the animal, and though great results have been attained in chronometer balances, still we seem to be a long way from the end of our journey in search of a perfectly compensating pendulum. I do not think that one in fifty of our mercurial pendulums are compensating. I did hear of one some time since. A gentleman was in town from an obscure village in Pennsylvania, and in the course of a conversation, began telling me of a wonderful clock he had in his store, which, he said had not varied fifteen seconds in twelve months from the standard time. Cold nor heat did not affect it in the least. Being somewhat jealous of country time, I felt disposed to argue the matter with him, but it was no use, he had me on all points. Just as I was about giving up in despair it occurred to me to ask him if he took his own observations? "Oh! yes, certainly," he answered, "I have a noon mark cut in the floor."

Mr. Hotchkiss filled an order some time since for a clock with a mercurial pendulum, the jar of which held one hundred pounds of mercury. I cannot say how well it compensated, for in a few weeks the jar got broke by accident, and the mercury lost. The owner did not despair, but ordered a new one.

Experiments have been made, and rules laid down for the exact weight of rod and stirrups, that a given column of mercury will compensate, yet no one seems to heed them. The stirrup in particular is designed more for show than compensation.

We can put a chronometer in a refrigerator, and run it forty-eight hours, and then in a hot bath for forty-eight more, and we very soon get at its adjustment; but with the mercurial or any pendulum, difficulties step in. In a regulator we can put lamps in the case, and heat it up in that way, and then open the doors and windows below zero, but I think them imperfect tests, particularly the heating.

The tower pendulum we can only adjust by watching in the heat of summer and cold of winter, and if we are very observing, and live to a good old age, we may get it adjusted.

I am well satisfied that if the City Hall clock had a wood rod, well seasoned and well varnished, and a very short pendulum spring, it would run at a better rate than now. We have, with the English, been accustomed to putting in our pendulum springs too long. You will see at Jones', in Courtlandt street, quite a good sized tower clock of German make, with a pendulum spring not to exceed a quarter of an inch long. But that is an opposite extreme.

A long, heavy pendulum seems indispensable for time-keeping. It should be as long as convenient, and as heavy as the clock is able to keep in motion without requiring power out of proportion to its size. It must have a controlling influence, a power in itself. It must rule, and not be ruled.

The nigher the center of gavitation is to the end, the more effective. Therefore, I have a great dislike to those massive grid-iron arrangements, which bring the length of seconds' pendulum to forty-seven or eight inches, with a ten-pound ball. A mercurial pendulum that beats seconds, will measure about forty-four inches. If the rod is heavy, they will measure more; if light, a little less. Some pendulums have been made to vibrate in four seconds. These would be fifty-two feet three inches from the point of suspension to center of oscillations, or about fifty-five feet whole length. Here another objection arises, for unless the rod is very large, the impulse causes a tremor, and consequent loss of power and motion. When St. George's clock was first set running, the rod had a decided tremor, but this was entirely obviated by a piece of wire ten feet long, put on each side, securely fastened at each end, and braced out in the center to six inches. This increased the motion and the speed ten seconds a day.

The point or center of oscillation is considered as fixed and immutable, and is the standard from which all calculations on pendulums proceed. This point is estimated at about 39.2 for this latitude for a seconds' pendulum. Now here comes a point that puzzles me. The computations to get at this center of oscillation, is based on laws of gravity. Now I cannot see why the two do not agree. Reid tells us that the center of gravity must be above the center of oscillation, the latter being a fixed point, the other not. I think it is conceded that if a ball were suspended by an imaginary line, the two points would agree, but as soon as we add a rod of any description, the gravity center raises in certain proportions. In a wooden rod pendulum, weighing ten pounds ten and a half ounces, of which the ball weighed ten pounds, Reid found the center of gravity was only one-tenth above the center of oscillation, while a gridiron pendulum, the ball of which weighed sixteen pounds three and a half ounces, and in all, with the rods, nineteen pounds nine and a half ounces, the center of gravity was two and a quarter inches above.

Another of this sort: the ball weighed ten pounds eight ounces, and the rod thirteen pounds five ounces, the center of gravity was found to be four inches above the center of oscillation. I tried a wooden pendulum with an iron ball eight inches in diameter, but quite thin, the ball weighing four pounds, and the rod and nuts two and a half ounces; and found the gravity center just half an inch above. 'Tis true, but why, I cannot answer. Reid says every mathematician knows it, but he does not say how they know it, and this is what puzzles me, being no mathematician.

To find the length of a pendulum that will make, say twenty beats in a minute, we figure about after this fashion:

$$\begin{array}{lcr}
20 & 39.2 & 60 \\
20 & 3.600 & 60 \\
\cline{1-1}\cline{2-2}\cline{3-3}
400 & 235.200 & 3600 \\
 & 1176 & \\
\cline{2-2}
 & 400)\ 1411.200 & \\
\cline{2-2}
 & 12)\ 352.8 & \\
\cline{2-2}
 & 29.4 \text{ inches.} &
\end{array}$$

Having the length of a pendulum to find how many vibrations it will give in a minute, divide the number 1411.200 by the given pendulum and extract the square root of the remainder. As it has been found impossible to make a pendulum that will make unequal vibrations in equal times, it becomes necessary to have the motor as perfect as possible. If teeth are not of proper shape, pitches perfect, and every part well finished, the impulses will be unequal, and the clock will not keep time. When the rod of St. George's was set swinging, and settled down to a normal gait, a mark was drawn on the floor. In about three months it has gained gradually, until it passes this line about one-eighth of an inch. This would make the gain in the whole length about one inch. I think it is the longest pendulum ever put up in this country.

One clock I have not mentioned, although it is not by any means the least among them. I speak of the Third Avenue depot. It has twenty-four inches main wheel, a pin escapement, and about twenty feet rod. It carries two dials, one illuminated on the avenue, the other in the rear, and can be seen the whole length of the stables and shops down to Second avenue. It is exposed to a greater range of heat and cold than any clock I know of, being close under an iron roof, that heats up to a higher point than the surrounding air in the summer, and is a little lower than it is in the winter. A man who winds and cares for about two hundred clocks weekly, has varied experiences, whether he profits by them or not.

Experiences bring to mind a very wealthy and withal a very profound gentleman, who lived in the East. This gentleman was very fond of collecting wise sayings, of writing them down, and repeating them to his neighbors. Now, he being very rich, and the sayings being, many of them, remarkable for brevity and wisdom, they were taken and handed down as law and gospel, even to this day. Among these sayings was this: "Experience teaches a dear school, but fools will learn in no other." Now, I don't like this. I say that experience keeps the cheapest school that a man of sense ever went to. No teacher can learn a fool, and it is only so far as men have wisdom that they learn in the school of experience.

But there are exceptions to even my rules, for time is money to the miser, and to mine uncle at the sign of the three balls.

## *TUNGSTEN STEEL.*

At the conclusion of Mr. D. W. Bradley's paper, which was received with applause. Dr. Feutchwanger exhibited a specimen of tungsten steel, manufactured in Austria from cast iron and wolfram ore. It is very close grained, hard, and suitable for cutting instruments, rock drills, &c. It cuts glass as readily as the diamond, and is an excellent material for rails. Dr. Feutchwanger showed also a specimen of wolfram ore, generally called tungstate of iron, which is used in the production of wolfram steel; and enumerated the different tungsten compounds.

## *GASSIOT'S TUBES.*

Dr. Preterre exhibited a chromic acid battery, which he used in connection with a cheap form of telegraphic dial, an electro-plating battery, and a simply constructed electric machine. He experimented with some glass tubes of various construction, and containing different gases, which, being placed in connection with the electric machine, showed the passage of electricity through them by differently colored and very beautiful streaks of light, the brilliancy of the effect of which was much enhanced by their rapid revolution on the cylinder, to which they were attached. The tubes were of such a small size as to be rather toys than anything else; but the exhibitor desired merely to show the effect produced by giving motion to what are known as "Gassiot's tubes." The cause of the striated colors produced by passing electricity through gases in a highly rarified condition, has not yet been satisfactorily explained.

Adjourned.

## January 16, 1868.

Prof. S. D. TILLMAN in the chair.

The following scientific notes were presented by the Chairman:

### NEW METHOD OF PRODUCING STEEL.

Mr. Heaton, of Nottingham, England, has invented a process for purifying iron and converting it into a kind of steel, which consists in using a cylindrical converter lined with fire-bricks, and an upright funnel to carry off the products of combustion; to this converter is clamped an iron box with a movable bottom, containing from seven to nine pounds of nitrate of soda, which is covered with a perforated iron plate. A charge of about fourteen hundred weight is run into the converter from a cupola. Rapid combustion takes place for about two minutes and a half. At first ruddy fumes, arising from the decomposed nitrate, are given off, somewhat similar to the scintillations observable in the Bessemer process. When the action has subsided the molten metal is run into ingots, which are said to be steel or a substance closely resembling it. This process, which seems not yet well systematized, is to be applied specially to the purification of the cinder iron produced in large quantities in Staffordshire.

### ARTIFICIAL GRINDSTONES.

Ransome's artificial stone—the silicate of lime—has been found to make excellent grindstones, remarkable for their uniform texture and fineness of grain. A pair of these were lately tested in England against a pair of Newcastle stones, under similar conditions. According to the report of this trial, a bar of steel, three-fourths of an inch in diameter, was placed in an iron tube fixed to the frame of the grindstone, in the end of which was a spring which pressed against one end of the steel rod, and thus kept the other end constantly against the grindstone. In sixteen minutes one-quarter of an inch of this rod was ground away by the artificial stone; the same rod was placed on the Newcastle stone, having twenty per cent greater surface than the other, and after eleven hours of similar contact the rod was ground away one-quarter of an inch—the value of the stones being as one to thirty-three. From an examination of specimens of this stone on exhibition in New York, we are forced to believe this report is greatly exaggerated.

### THE POTATO.

Mr. George May, of Benthall, England, in his prize essay on the potato, gives the results of experiments on 129 trial plots, which may be summed up as follows:

1. Every increase in the size of the set, from one ounce to eight ounces in weight, produces an increase in the crop much greater than the additional weight of the set planted. The net profit, over and above the extra weight of sets, in planting four ounce sets in lieu of one ounce sets, amounted, on the whole series of experiments, to between three and four tons per acre; and the further profit, on the increase of the size of the set from four ounces to eight ounces, averaged about five tons per acre, all the intermediate steps partaking proportionately of the increase.

2. The advantage of large sets is more marked in the late than in the early varieties.

3. In the use of small sets, of from one to three ounces in weight, a large balance over and above the weight of the sets was obtained by planting from six to nine inches apart in the rows than at wider intervals.

4. Increasing the intervals at which the sets are planted, even of the largest size, in the rows, to more than twelve inches, diminishes the crop, and the wider intervals induce no increase in the weight of the produce of the individual sets.

5. It may be broadly stated that the weight of the crop is proportionate to the weight per acre of the sets, and that small sets will produce the same crop as an equal weight per acre of large sets. The fact is, however, of limited application, as a weight of very small sets, equal to a weight of full sized potatoes, could not be got into the ground, except by planting them so close as to be prejudicial to the crop. The advantage, therefore, of large sets remains practically unimpaired.

6. Weight for weight cut sets produce as nearly as possible the same weight per acre as whole potatoes, but, for the reasons given above, the weight of the sets should not be reduced by subdivision.

7. Smaller sets give a larger produce in proportion to their weight than the larger sets.

8. When the intervals between the sets in rows are diminished to less than a foot, the produce of each individual set is proportionately diminished. Though this is not necessarily accompanied by a diminution of the weight of the crop, no increase in the produce of each individual set is caused by placing the sets at intervals wider than a foot.

9. With reference to the relative produce of different varieties, a late red sort takes precedence throughout the experiments; and of the several varieties of Fluke, "Spencer's King of Flukes," and "The Queen of Flukes," are much more prolific than the ordinary variety.

As to the manure best adapted to the potato, it was found by Dr. Lang that all nitrogenous dressings tried in Devonshire were rather prejudicial than otherwise, as regards the potato disease, but that wood ashes (which abound in potash), and lime and salt were beneficial.

Experiments with regard to manures were carried on under the direction of Prof. Voelcker, and on examining them the following deductions have been made:

1. The best crop was obtained by the use of rotten barnyard manure.

2. Superphosphate and crude potash salts—a purely mineral manuring—gave a nearly equal increase. The mixture of superphosphate and crude potash salts appear to be specially useful for root crops on light land.

3. Common salt enhances the efficiency of the superphosphate and potash salts, but when used alone it slightly diminishes the crop.

4. Potash salts applied alone, though by no means the most desirable manure for potatoes, nevertheless had a better effect than common salt; for while the crude potash salts gave an increase of nearly eight hundred weight per acre, common salt produced seven hundred weight and forty-four pounds less than the unmanured plots on the average.

### TO WHITEN LACE.

Lace may be restored to its original whiteness by first ironing it slightly, then folding it and sewing it into a clean linen bag, which is placed for twenty-four hours in pure olive oil. Afterward the bag is boiled in a solution of soap and water for fifteen minutes, then well rinsed in lukewarm water, and finally dipped into water containing a slight proportion of starch. The lace is then taken from the bag, and stretched on pins to dry.

### DETECTING BELLADONNA.

Mr. H. C. Scorby read a paper lately before the Sheffield Literary and Philosophical Society, in which he set forth the difficulties which the toxicologist encounters in his efforts to prove a case of poisoning by belladonna. These difficulties are obviated by the use of the micro-spectroscope. The spectrum of the juice of belladonna is very distinct, especially when the coloring matter has been added to a solution of carbonate of soda. A small fraction of a single berry is sufficient to produce the spectrum bands characteristic of the belladonna.

### THE WALRUS.

A young male walrus has lately been placed in the Zoölogical Gardens, London. He is probably not more than a year old, and has only partially developed tusks; is eight feet long, and weighs about two hundred and fifty pounds. He was captured by Capt. R. Wells, of the whaler Arctic, in latitude sixty-nine degrees N., and longitude sixty-four degrees W., on the the 24th ot August last. Several hundred of these animals were met on ice, and attacked by a boat's crew. Among those killed was a lage female; on towing the body toward the ship, a young male was seen diving and swimming around its deceased parent; he was captured by a noose swung over his head, and hauled on board. For several days the young captive was kept tied to a ring-bolt on the deck, and refused food altogether. Subsequently he was induced to swallow thin slips of boiled pork, and was thus fed until the vessel reached the Shetland islands, when a supply of fresh muscles was provided for his use. The stranger excites great interest at the Gardens. The only specimen before seen there was in a moribund state on its arrival, and lived but a very short time.

### SPIDERS.

Father Babaz has communicated to the French Academy of Science an account of his experiments with spiders, and the manner in which he ascertained a fact hitherto unknown to naturalists, viz: That most spiders possess not only the faculty of spinning a thread, but also that of projecting one or several, sometimes of the length of five or six meters, which they use to traverse distances with, and affix their thread to a given point for the support of their web. They even seem to have the power of directing the extremity of an ejaculated thread to a given point; they seem to feel for the place where it is most desirable to fix it. Certain spiders, the Thomisa Bufo, for instance, will eject a bunch of threads, which, curling up in the air and shining in the sun with various hues, give the insect the appearance of a peacock displaying his tail. But this is not all; spiders can fly and swim in the air, though they are heavier than alcohol. To perform this feat they turn their back to the ground, and keep their legs closely folded up on their body, and in this posture sail about with perfect ease.

## THE CEREBELLUM.

In alluding to the somewhat sharp controversy which has taken place between Prof. Huxley and *The Pall Mall* reviewer of Dr. Tyndall's work on "Sound," *The London Review* says the point at issue has been much more complicated in the course of the discussion than it need to have been. It is simply this: Was Dr. Tyndall correct in stating that nerves have their origin in the brain, or was the reviewer in *The Pall Mall Gazette* right in stating that no nerves rise from that source? In answering this question there arises a second query, what is understood by the term brain? To this the reviewer replies, the word brain is the synonym for the cerebral hemispheres only. We cannot regard this as correct; it may be that one individual anatomist has confined the term "brain" solely and exclusively to the cerebral hemispheres, but as to the ordinary acceptation of the word, there cannot be the smallest doubt. Go into any dissecting room in London and ask the demonstrator to show you a brain, and he will most assuredly place before you the whole nervous contents of the cranium. Look under the head of "Brain" in any treatise on anatomy which our language possesses, and the same general definition will be found. Hence we think Dr. Tyndall's statement, that the nerves arise from the brain, was not only accurate as to the general application of the word "brain," but that the contrary assertion is, however, equivocally justifiable, most certainly opposed to the terminology of the British School of Science, for which Dr. Tyndall was writing. Indeed, the mere fact—which curiously enough the writer in *The Pall Mall Gazette* cites in his favor—that the cerebellum is styled the lesser brain, is of itself sufficient to decide the question; it shows that the word "brain" is eminently generic, and includes the specific divisions cerebrum, cerebellum, medulla oblongata, &c.

### RELATIVE EFFICIENCY OF IRON AND CAST-STEEL BOILERS.

An important series of experiments, to ascertain the comparative evaporating power of iron and steel boilers, were lately made by G. Stuckenholz, at the rolling mills of Messrs. Funke & Elbers, of Hagen, Prussia. The two boilers were each five feet in diameter and thirty-four feet long—constructed to stand five atmospheres "over" pressure. One was made of wrought iron and the other of soft cast-steel. The thickness of the sides in the cylindrical portions of the iron boiler was 0.50 of an inch, and of the cast-steel boiler 0.33 of an inch. Each boiler had a heating surface of 293 square feet and twelve square feet of grate surface. Both were new and had never been before heated. They were set alike in brick work, one above the other, but entirely separated by masonry; the gaseous products of combustion passed through a single flue underneath each boiler, and passed directly into the same chimney. At first both boilers were filled, and fires were kept under them for several days in order to dry the brickwork, after which the fires were extinguished and the boilers emptied and cleaned. Each boiler then received exactly 712 cubic feet of feed-water at thirty-five degrees C. temperature; the man-holes were closed, and the water was heated to the boiling point; again the fires were put out, and all the ashes and coals taken away. From this point the boilers were fired afresh, and fed with weighed fuel; the man-holes, hitherto kept closed, were now opened to allow the steam to escape, and the firing was so well regulated, by means of dampers, that the velocity of the escaping steam—measured by List's Velocimeter—was the same in each boiler. The temperature of the gases from the fire was measured, at a point six feet from the rear end of each boiler, by Gauntlett's Pyrometer, and found to vary from 340 degrees to 380 degrees C.

After consuming on each grate 3,150 pounds of coal of the same quality, the cinders of which were burned over and over again, the fires were put out and the man-holes closed. On the following day the remaining water of the boilers, showing a temperature of thirty-five degrees C., was let out through the emptying tube, situated at the lowest part of the boiler, and measured by means of a hydrometer adapted to the tube. The iron boiler showed 387 cubic feet, and the steel boiler 331 cubic feet of the remaining feed-water. Therefore, the water evaporated in the iron boiler was 712—387=325 cubic feet, or 20,065 pounds; and that evaporated in the steel boiler was 712—331=381 cubic feet, or 23,523 pounds.

Hence the evaporating capacity was proved to be 17.20 per cent in favor of the steel boiler. One pound of coal evaporated in the iron boiler 6,350 pounds of water, and in the steel boiler 7,467 pounds of water at 100 degrees C.

At the next trial the whole operation was performed in the same manner, only the velocity of the escaping steam was less. It resulted in showing 19.62 per cent in favor of the steel boiler. One pound of coal evaporated in the iron boiler 5,809 pounds, and in the steel boiler 7,008 pounds of water.

These two experiments were verified in the following manner: To an equal quantity of feed-water in each boiler an equal volume of a strong solution of salt was added. After stirring the water for some time, by means of long poles, and boiling it with closed man-holes, samples were taken out for future analysis. On completing this experiment in which equal quantities of fuel and water were used, further samples were taken out. The analysis of the samples by Dr. List, of Hagen, showed that in the iron boiler one quart of water contained before evaporation 4,627 grammes of chloride of sodium, and after 5,985; in the steel boiler one quart contained 4,371 grammes before, and 7,385 grammes of salt after evaporation; the iron boiler lost 33.76 quarts, and the steel boiler 40.81 quarts of water, showing 20.85 per cent in favor of the latter. The average per centage of these three experiments is 19.24 per cent in favor of the steel boiler, which it will be noted had a shell thirty-three per cent thinner than that of the wrought-iron boiler.

As usual, considerable discussion followed the reading of these scientific items, the most being said regarding steel, and the peculiar properties of tungsten as a component of steel.

Dr. Vanderweyde exhibited a tungsten steel knife of very ordinary pattern, and proved its power of cutting glass. A question was started respecting the truth of the statement that a Paris chemist had succeeded in giving to charcoal the diamond property of cutting glass. Prof. Joy stated that it was true to a certain extent, but that it had been accomplished only at an outlay of time and money, which would make the charcoal more expensive than the native diamond.

### WROUGHT IRON RAILWAY CAR.

Mr. La Moth exhibited a cross section of a metallic passenger car. Its chief merit seems to be its pecular construction, for which tubes are used, instead of bars, and which are curved at the corners, and not bent at right angles. Its claim was for great durability, enabling it to withstand any accident or wear. Apart from the fact that it cannot be burnt, or easily destroyed, it possesses the recommendation of cheapness, costing about twenty per cent less than other patterns. One of these cars has been in use since 1859, and though it has been in one collision, it is pronounced now almost as good as new. A small model car chair about three inches high, dependent on the same principles of construction, was also exhibited, which it was boldly stated would sustain a weight of two hundred pounds. The covering of the car was to be metallic, and of a very ingenious principle. The windows were to be sufficiently long to permit the escape of passengers, should the doors in any accident be closed.

### *SUSPENSION BRIDGES.*

The following paper was read by Charles Bender, civil engineer (formerly assistant at the Polytechnical University at Karlsruhe, in Germany):

In the present day of long-span bridges, more particulary those of suspension, across the wide rivers of this continent, it may not be uninteresting to the civil engineer to trace the successive improvements in their mode of construction, and to fix definitely the claims of inventors and designers to such improvements as they may be respectively entitled to. I am not aware that the subject has been treated in this light before, and therefore, in view of its importance, make no further apology for occupying your attention.

I found in an old book the following sentence:

"The invention of the suspension bridges by Sir Samuel Brown sprung from the sight of a spider's web hanging across the path of the inventor, observed on a morning's walk, when his mind was occupied with the idea of bridging the Tweed."

The artificer of the web who really guided Sir Samuel Brown, was the American engineer James Finley, of Fayette county, in the State of Pennsylvania. He, in the year 1796, built the first regular suspension bridge across Jacob creek on the turnpike from Uniontown to Greensburg, in the State of Pennsylvania. He obtained the first patent on this object from the Government of the United States, and the book, "Treatise on Bridge Architecture, by Thomas Pope," published in New York in the year 1811, spread this ingenious invention over the whole world. Some English and French authors, and even Pope, tried to diminish Finley's merits by attributing this invention to the Chinese and Indians, but these people used only ropes or common chains, fastened to trees, and the path was directly on the catenary, without suspended floor.*

The development of the art of bridge-building is showing and proving how deeply James Finley had studied his task, and how much we owe to him.

The principal features of his invention consisted in the application of artificial stone abutments, in the introduction only of two chains, one at each side of the bridge, the links of which were as long as the distances between the cross-bearers or joists. Finley applied one-seventh of the spans for the deflections of cables, introduced suspension rods and stirrups to support the joists, and arranged the anchor chains at the same angles as the main chains, to avert powers acting to throw down the piers.

The most interesting of the novelties, and one upon which Finley apparently laid a great value, was the arrangement for distributing the load over a great extent of the bridge, thereby aiding to divide it over many suspenders, and to stiffen the otherwise movable floor against change of shape.

His specification reads as follows :

"To bind and connect the whole that they have the same effect as a platform of one piece, four or more joists will be neccessary for the upper tier—to extend from end to end of the bridge; each will consist of more than one piece, the pieces had best pass each other side by side, so that the ends may rest on different joists on the lower tier. The splice will then extend from one joist to another of the lower tier, and must be bolted together by one bolt at each end of the splice. The planking floor is laid on the upper tier."

Herewith the inventor formed strong beams, continuous from one end of the bridge to the other, and the continuity itself gives the utmost certainty, that these beams, which were no directly bearing parts, had the aforesaid important object, to stiffen the floor, pre-

* At the discovery of America similar constructions were found there.

Humboldt found in the year 1802 a suspension bridge across the river Chambo, in Peru, the ropes being three feet thick, made of roots of the *Agave Americana*. The span was forty feet.

In the year 1515 the Landsknechte, a kind of regular troops (Germans and Switzers), built a rope-bridge across Padus river, in Italy, which they passed with artillery.

In the year 1595 Admiral Coligny, in France, made a rope-bridge near Poitier.

In the year 1734 the army of the Palatinate of Saxony, in Germany, built a chain bridge across the Oder river near Glorywitz, in Prussia.

The bridge across the Tees in England (1741), seventy feet long and two feet wide, was like those constructions in China and Thibet, having chains fastened to timbers, the planks laid on them directly.

vent greater changes of form, or in other words to neutralize the momentum arising from loads and wind.

The method employed was sufficient for the spans at that time in use, and in connection with the stiff railing, fulfilled entirely the conditions necessary for a good bridge for common traffic. For the time in which Finley lived, his bridges were astonishing structures in reference to the insufficient knowledge of the art of frame bridge building, and spans of three hundred and six feet at the commencement of the nineteenth century, appear bolder than twelve hundred hundred feet in our days.

We can learn by studying Finley's plan, how the neglect of his well-founded directions caused many disasters to suspension bridges.

It is astonishing how few understood him. Instead of keeping the stiffening continuous beams, and instead of proportioning the same according to the spans and loads of the bridges, it was believed to be an unnecessary weight and increase of cost of bridges; and instead of adapting great deflections of cables or chains, it was believed to be a better arrangement by taking flat arcs, and deflections equal one-fifteenth of the spans, whereby the cost of bridges became nearly double as great as before.

Till the year 1801, according to Finley's patent, eight bridges had been built in the United States, and there have been added forty others between the years 1801 and 1808. The largest of all was the Schuylkill chain bridge, of three hundred and six feet span.

It is not uninteresting to know the names of some of the first buildings of this kind.

The Potomac bridge, near Washington, had one hundred and thirty feet span, its floor being fifteen feet wide; the Cumberland bridge in Maryland, had the same span; the Brandywine bridge, near Wilmington, was built with one hundred and forty-five feet span, and a thirty-feet wide floor, and two other bridges were built of one hundred and twenty feet span each, at Brownsville, Fayette county, in the State of Pennsylvania. A bridge across the Merrimac, three miles from Newburyport, in the State of Massachusetts, carried out by an engineer of the name John Templeman, of the District of Columbia, is more particularly described, and is one of the most interesting buildings in the history of bridges. The span of this bridge was two hundred and forty-four feet; the abutments forty-seven feet long and thirty-seven feet high, were made of good masonry. The two roadways of fifteen feet width each, were strong enough to allow for the passage of horses and carriages, whatever their speed. Ten chains, each five hundred and seventy-six feet long, were made to bear five hundred tons with perfect security. Three of the chains were fastened on each side of the bridge, and four in the middle. "The railing was stout and strong," a construction, which "contributed much to the stiffness of the floor." Thomas Pope himself calls it a wonderful structure, describes the railing as contributing much to the stiffness of the floor, and states that Templeman's talents and improvements had earned for him a great reputation as engineer of such work. He also reported that the motion of the floor of the Merrimac bridge was "very little perceptible, whatever the speed of any kind of traffic."

The bridge across the Lehigh, built in the year 1815, near Northampton, in Pennsylvania, consisting of two whole and two half spans four hundred and seventy-five feet long, bearing two tracks for carriages and two six-feet wide footpaths, was the first mentioned suspension bridge of more than one span.

The application of wire for suspension bridges is also an American invention, for the first wire bridge was built before the year 1808, at Philadelphia, across the Schuylkill river, with a span of four hundred and eight feet. I found in the book on wire bridges, by the French engineer, Seguin, published in the year 1824, that a report on the American canals, written by Mr. Gallatin, in the year 1808, and copied in a French book from the year 1820, mentioned the wire bridge at Philadelphia. The same bridge is also described in the "Bulletin de la Société d'Encouragement," in the year 1816.

According to these notices, the existence of the American wire suspension bridge was well known in Europe a long time before the first regular suspension bridge was built there.

Pope's book was well known in France, and Seguin, as well as the famous French engineer, Navier, made use of it. Finley's important invention, in connection with Templeman's improvements, as well as Pope's book, and the wire bridges built in this country, were known in England by Samuel Brown and others in the year 1814, and it is most probable were known in France, for the brothers Seguin, French engineers, seem to have been in England, and Navier especially was sent there to study suspension bridges.

At that time a Frenchman of the name of Poyet, proposed a kind of stay bridges, consisting of high wooden masts as towers, from the tops of which were starting many stays to both sides supporting the floor.

But the English engineers were the first who proposed and applied stays for suspension bridges, in connection with cables as well as without them.

The first of these bridges was built by Richard Lees, at Galashiel, across the river Gala, in the year 1816, of a span of one hundred and twelve feet; it was like the two following, a wire bridge. The bridge at King's meadow, across the Tweed [span one hundred and ten feet], was built in the year 1817, and another structure at Thirlstone Castle, one hundred and twenty-five feet long—both with stays. At Kelso, on the Tweed, a bridge of three hundred feet span was built for carriages—the roadway eighteen feet in width. A bridge at Dryburgh Abbey, with stays, was two hundred and sixty feet long, and very movable; so much so, that four persons could shake it so as to break one of the stays. In the year 1818, a wind destroyed the whole structure. Rebuilt according to Finley's system, provided with strong longitudinal beams, strong railings and anchors like those at Niagara bridge, it resisted the obnoxious motion. Especially is it stated that the railing resisted all upward movements. The use of anchor chains, to prevent side and upward movements of the floor is, therefore, already very old, and Sir Samuel Brown often made use of them.

The bridge at Dryburgh is very interesting in another reference, as it is the first wherein the chains were convergent in the middle of the span. At the towers of this bridge the distance apart of the cables was twelve feet, and in the middle of the bridge it was only four feet; the object being to reduce the side motion. But the engineer, Stevenson, already observed that he preferred to keep the parallelism of chains, and rightly, as I hope fully to convince you in a future communication.

A great many of the stay bridges broke down, and after many sad experiences, the use of stays has been entirely rejected by English engineers, notwithstanding they have been reintroduced into this country.

Navier saw different bridges built by Brown in England, and he describes the action of the stays in aiding to support the floor; others were introduced horizontally, but inclined to the longitudinal axis of the bridge, to reduce the side motion, and he criticised sharply the combination of stays with suspension rods and chains or cables.

The use of separate tension cables attached to the two towers, working horizontally or vertically against the action of the wind;

the application of pendulums to support the cables on the pillars, allowing expansion and contraction of cables, are ideas of the famous engineer Brunel. These applications are made at Brunel's bridge, on the Island of Bourbon, and are copied at the suspension bridge across the river Meuse, at Liege, in Belgium, and at the Allegany bridge near Pittsburg.

Telford, the engineer of the Menai Straits suspension bridge in England, as far as I can learn, added the improvement of saddles on rollers supporting the cables or chains, to allow for the movements in case of change of temperature. The railing of this bridge was proposed six feet high, the span being five hundred and sixty feet.

I have mentioned that by the French government, in the year 1821, Navier was sent to England to study the existing suspension bridges and to report on the same. He collected the different historical notices, described Finley's and the English bridges, and gave the theory of movable suspension bridges in his classical book, published in the year 1823. The curve of the suspension cables when loaded, Navier first regarded as parabola, rejecting the complicated older formulæ as given by Jacob and John Bernouilli, Huyghens, Euler and others. It is to be regretted that this celebrated and highly scientific man, overlooked the influence of wind acting from below on the floor, and thus becoming the most dangerous element to destroy suspension bridges. Indeed, Navier's theory and his reputation contributed much to the false judgments about Finley's improvements, and caused the error of introducing small deflections and of omitting the American longitudinal beams and railings, these important stiffening elements, which, in the right proportions, are inseparable from any good supension bridge.

Finley expressly advocated the construction of platforms of one piece, but Navier and his followers supposed a perfectly movable floor. Finley applied $\frac{1}{7}$, Navier $\frac{1}{12}$ to $\frac{1}{15}$ of the spans for deflections. Finley prevented the undulations by his stiff platform; Navier believed he could prevent greater deplacements by flat catenaries. This is the great antithesis of these two celebrated engineers, and every scientific bridge builder must concede that Finley stood much nearer to the perfect solution of this problem than Navier.

But notwithstanding Navier's book was of great value to science, and he opened for investigation many interesting questions.

Navier paid attention to the effect of change of temperature on suspension bridges, and after having examined the use of rollers on the towers, he gives some hints about the effect of the same forces on the platforms, which he supposes to be movable. His own words in this respect are:

"By applying continuous longitudinal pieces in the platform of the bridge, it will be necessary to compound these pieces of parts connected by joints, which leave a little freedom, so that the adjoining parts can slip on the others, where the heat is lengthening the same."

But it is not to be understood that Navier meant to apply such slipjoints to the cords of a truss, for in our climate such a truss would not begin to work before it was bent to deflections equal to about $\frac{1}{60}$ of the span. Hence, it follows that if such a truss with slipjoints were applied to a suspension bridge, it would not work at all, but merely act as a dead weight.

In the same classical book, Navier describes the suspension canal-bridge, built by Count Chabrol in the department of Puy-de-Dôme, in France, the length of which was six hundred and fifty feet, and and he gives calculations and plans of a project of this kind. These ideas and plans have been applied by constructing the Pennsylvania canal-bridge for spans of one hundred and sixty feet.

The first suspension bridge on the continent of Europe was built in the year 1823 at Geneva, in Switzerland by Colonel Dufour. It was a wire bridge.

In the year 1824 the elder Seguin published the first edition of his work on wire bridges; a book important in many respects, giving many new ideas and improvements.

There the utility of the stiffness of the platform of suspension bridges was not overlooked, as was done by Navier and the English engineers. On the contrary, the meaning and the importance of stiff railings as well as of longitudinal beams was fully appreciated.

I must not omit to translate a portion of this work, throwing light on the fact, that James Finley and Templeman are to be regarded as inventors and improvers of suspension bridges with stiffened floors, rejecting all later pretensions and claims of this kind.

In the aforesaid book is to be found:

"One of the greatest inconveniences of suspension bridges are the vacillations arising from moving loads of any considerable masses. To prevent these, there should be employed all possible means affording rigidity; the very best of all existing of which I know is the arrangement of strong trusses as parapets of the bridges.

These have to consist of long pieces of wood forming the frames, and of wooden Andrew crosses put together at right angles. The connections of the different pieces should be made by iron bolts, piercing the frames or cords between the joints of the diagonals, allowing any desired tension and great rigidity."

Further, Seguin says:

"The first quality of the floors or platforms of suspension bridges is to have as much rigidity as possible, and to obtain it care is to be taken to fasten together the different parts, so as to get a continuity preventing any separation. It is customary to attach the suspension rods to cross bearers which are supporting the floor itself, but it is possible as well to apply longitudinal pieces to support the cross-bearers, and it seems to me to be far preferable to establish in all cases longitudinal flooring before cross-bearers. The longitudinal pieces had to be of the greatest possible dimensions, their joints to be well connected to avert those horizontal movements, which are consequences of the deficiency of continuity in the floor.

"The Americans had adopted one-seventh of the spans for deflections of cables. This disposition, being very favorable in reference to solidity, is inconvenient in regard to deplacements, which become always the less the more the deflection of cables is diminished. But the Americans have neutralized that inconvenience by adding to the floors great masses, and using strong railings to increase the rigidity."

Concerning the said masses, Seguin meant evidently Finley's longitudinal and continuous beams laid on the cross-bearers; the weight and action of which reduced the side motions caused by wind, and which had, besides this effect, the more direct object which Seguin mentioned before, but did not understand fully. Navier's influence on Seguin is evident already.

The brothers Seguin introduced the method of boiling the wire in oil, thus giving a good coating as a preventive of rust. But they observed that the wire, after the process of boiling, lost a portion of its strength, an observation which is confirmed by newer and very minute experiences of reliable men.* Indeed, the temperature of boiling linseed oil is at six hundred degrees Fahr., which is the same temperature required to soften steel, at which that dark-blue color, so characteristic of the tempering of steel, is observable.

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* Experiments by Professor Karmarsch and Engineer Brix, in Prussia.

The method of covering the chains with white instead of any other color, as was Finley's practice, is first mentioned in the description of the Hammersmith bridge in England. The same Hammersmith bridge, as seen in the year 1854, was stiffened horizontally by cast iron beams, suitable chords and diagonals, and the vertical movements were prevented by strong railings. This was perfectly sufficient for common traffic, and the Hammersmith bridge was celebrated for its good proportions and strength.

Many bridges of this time suffered by gales of wind; many of Brown's structures, and generally those near the sea, and more especially those constructed with stays, were destroyed entirely; others badly damaged. Telford's Menai bridge, for instance, was extensively injured, and the engineers fell into the great mistake of preventing the undulations and motions, caused by wind, by increasing the dead weight of the bridge itself. The floor of the Menai bridge has a weight of ninety-seven pounds per superficial square foot. But the evils of this system soon produced a change in the opinions of the engineers, and it was the engineer Rendel, to whom was confided the repair of the suspension bridge at Montrose, who was induced to apply a good method of stiffening the floor of suspension bridges. Though undoubtedly Finley and Templeman are to be regarded as the first constructors of stiffened suspension bridges, as we well know, and as Rendel's method is merely one of its applications, yet the ideas in that time were disturbed to such a degree, that he is to be regarded as the true reformator of suspension bridges, and as the man who again brought to clear understanding the idea of longitudinal beams and trusses reaching from one end of the bridge to the other. Rendel also condemned more decidedly the use of stays, and proved by fact the truth of his judgment.

This bridge of Montrose was built in the year 1825, by Samuel Brown, its span being four hundred and thirty-two feet, deflection of cables equal to forty-two feet, and width of floor twenty-six feet. In the year 1838 the platform was destroyed by a heavy gale, and in the year 1840 the chains gave way with a load of seven hundred men on the floor, whereby a considerable loss of life was caused.

Rendel, in his report, says:

"In the anxiety to obtain a light roadway, mathematicians, and even practical engineers, had overlooked the fact that when lightness induced flexibility, and consequently motion, the force of momentum was brought into action, and its amount defied calculation.

"The author has long been convinced, of the importance of giving to the roadway of suspension bridges the greatest possible amount of stiffeness in such a manner as to distribute the load or the effect of any violent action over a considerable extent. The platforms of large bridges in exposed situations are acted upon in so many different ways by the wind, that he had an objection to the use of stays or braces to counteract movements which ought rather to be resisted by the form of the truss-structure. Holding such opinions, he determined to adapt a framing, which, although connected rigidly in every direction, should nevertheless be simple, composed of few parts, capable of being easily renewed, should distribute its weight uniformly over the chains, not be subject to change from variation of temperature, and not augment the usual weight of suspended platforms."

According to these principles, which are embraced entirely in the old American inventions, but more defining the same, Rendel repaired the Montrose bridge in the following way: "Instead of cast-iron cross-bearers, he adopted wooden joists thirteen feet by three and a half feet, bolted together and trussed with a round bar of one and one-eighth of an inch diameter; every sixth beam had a deep trussed frame on the under side, so as to give great stiffness above and beneath the cross-beams; on each side of the carriageway were bolted two sets of longitudinal timbers, four in each set; they were further united by cast-iron boxes at intervals of ten feet. A curb of timber eleven inches by six inches was attached to the ends of the cross-bearers, and extended the whole length of the platform. To add to the stiffness afforded by this construction, the author caused to be passed through the spaces between the pair of longitudinal beams, a series of diagonal truss-pieces of timber, six inches square, with the ends stepped in the cast-iron boxes, which at every ten feet grasp the beams. On the other end of these diagonal truss-pieces, an iron screw bolt one inch and a quarter diameter at every ten feet, and a contrivance of wedges in the cast-iron boxes, enabled any degree of tension to be given to the framing. The roadway was thus stiffened by two of the strongest kinds of framing in parallel lines, dividing the carriageway from the the footpaths."

This truss work, with the perfect understanding of the working momenta, was expressly made to resist flexures upward as well as downward, an arrangement omitted in one of the greatest existing constructions.

The requisite horizontal stiffness was obtained in the following way: "The carriage way was formed of four thicknesses of Memel planks, the two lower layers, each two inches thick, were placed diagonally with the transvere beams crossing each other so as to form a reticulated floor, abutted against the longitudial beams. They were firmly spiked to the beams and to each other at all the intersections, and upon them was laid and spiked a longitudinal layer of planking two inches thick. Each layer was closely jointed and caulked, and the upper one was laid in a mixture of pitch and tar; a composition of fine gravel and sand cemented with boiled gas-tar was laid over the whole, to the thickness of one inch, forming the road track."

The absence of Brunel's counter chains and of Brown's counter stays, and other unnecessary and even dangerous furniture, is to be regarded as highly commendable.

"The whole formed a compact mass of braced wood work, the diagonal planking giving the horizontal stiffness, and the two trussed frames insuring the vertical rigidity."

It is interesting to know the weights of this structure, as important concerning the art of building suspension bridges with stiffened floors.

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|---|---|
| The weight of the roadwork was | 131 tons. |
| " of cast and wrought iron | 37 tons. |
| " of suspension rods | 21 tons. |
| " of fencing (wrought iron) | 9 tons. |
| " gravel concrete | 30 tons. |
| Total | 228 tons. |
| Per running foot | 0.53 tons, |

or forty-seven and a half pounds per superficial square foot, for the entire roadway. Subtracting the gravel concrete, it is forty-one pounds. Before the bridge was stiffened, the weight was forty-four pounds per square foot.

The bridge has borne without injury heavy gales, as could be foreseen, and the stiffness has given confidence in the strength to all who have examined it.

The English engineers agreed with Rendel, and the engineer Vignoles, eulogized this excellent communication for the practical conclusions which it contained. He found it not difficult to foresee, that by carrying out the system of adopting well trussed framings to the platforms of suspension bridges, sufficient rigidity would have been obtained for locomotive engines and carriages on railways to traverse rivers or ravines by means of these bridges, instead of the costly viaducts or heavy embankments; and Mr. Rendel saw no difficulty in giving any required amount of rigidity to the platforms; it was only necessary to increase the strength of the framing to enable the roadway to bear with perfect safety the passage of an engine and train of carriages.

In the meantime the wire bridges found a favorable reception in France, which is full of admirable structures of this kind, and the French engineers brought the manner of constructing cables to the high degree of perfection of our day.

After the preceding introduction of wire bridges in England and Switzerland, the brothers Seguin constructed the first wire suspension bridge in France, in the year 1824. All the existing methods of splicing wire, of bringing up the cables, have been studied, and theories of great mechanical value have been invented.

The cables were first made on land and then carried on the towers by machinery, but soon the French engineers began to build them on the towers themselves. Very perfect methods have been employed, securing all possible equality of tension in the single wires; and as greater perfection always requires more time and trouble, these methods are more expensive than those of a later origin, which, shortening a little the time of construction, are not securing the same equality throughout.

Now, the time to make a wire cable of one thousand six hundred feet length, is about one year, which involves a great loss when we consider that steel chains can be obtained cheaper, much more secure, much lighter and better than any wire rope can be, and by the use of which the time for building suspension bridges is considerably reduced.

Such a steel chain bridge was built in Vienna in the year 1829, by the Austrian engineer, Mitis. It is praised in all reports as a strong structure.

The wrappings of the French cables are made at intervals of about one foot; in later times the wrappings have been made continuous.

In the year 1831, the French engineer Vicat, in his report on the suspension bridges across the river Rhone, described his method for building wire bridges in place, directly on the towers and abutments, a method which, essentially in the same manner was copied by erecting the Niagara and Cincinnati bridges. This method is described as follows:

"The towers and abutments of a suspension bridge being finished, the points of attachment ready to receive the cables, and supposed that a number of double wires of equal lengths, forming circuits, are wound on different reels, these wires are drawn from one pillar to the other by means of a thin endless rope, like the guide rope of a flying ferry and moved like the chains of a chain-pump."

By this method, Mr. Vicat proposed to make and suspend cables, with less cost, with fewer workmen, and in shorter time than before. He said it was not difficult to reduce the number of cables to two, if it was desired, whereby the surface exposed to oxidation would be diminished; the tension of the single wires would be uniform, whatever the thickness of the cables; the apparatus for elevating the cables be simplified, and the greatest possible spans would be admissible.

More details on this subject can be found in the article on the bridges across the river Rhone, in the French "Annales des Ponts et Chaussées," 1831, volume first.

Mr. Chaley, the engineer of the celebrated suspension bridges at Friburgh, in Switzerland, worked out Mr. Vicat's method, and often had occasion to apply to it. He, according to the same method, built the second suspension bridge at Friburgh, in Switzerland; further, the bridge "de la Charité," across the river Laire, a suspension bridge in Paris, another at Percey, in the Jura mountains, and the bridges at Cormery, across the Indre, and of Beaumont, across the Sarthe, in France.

Vicat's method was further employed at a bridge at Tours, in France, for transporting materials. Interesting details are found in the "Annales des Ponts et Chaussées," in the year 1841.

Other methods for constructing the cables of suspension bridges directly on the towers and abutments, is that of the French engineer Le Blanc, constructor of the splendid bridge at Roche-Bernard; and, after him, that method introduced by the French engineer La Clerc, the constructor of the suspension bridge at Lorient, across the Scorff. The anchorage of these bridges (the first is of 643 feet span, the other 610 feet) is interesting, as the cables form one continuous belt, laid around the abutments in suitable vaults, allowing free circulation of the air, as well as to repair the painting of the wire from time to time. The two cables, at both sides of these bridges, have the same deflections, an arrangement which is not objectionable. [The descriptions can be found in the "Annales des Ponts et Chaussées," 1850.]

The French methods and designs have been used in our country; especially the method of constructing the cables directly on the towers, in the year 1844, at the Alleghany suspension bridge, near Pittsburg, and Vicat's invention was a little but not essentially modified at the construction of the Niagara and Cincinnati suspension bridges by Roebling.

A picturesque suspension bridge is that at Cubzac, across the river Dordogne, in France, with five continuous spans of 363 feet each, the towers being constructed of iron (iron towers eighty-two feet high; total height of towers above low water=126 feet).

Iron towers also are used at the chain bridge at Seraing, in Belgium, and at the chain bridge at Muehlheim, on the Ruhr, in Prussia.

Since the accident of the wire bridge at Angers, in France, in the year 1850, many of the wire bridges in Paris have been replaced by truss and arch structures, and a law is introduced directing tests of wire bridges from time to time. During such a test in the year 1861, the suspension bridge at Mirabel sur L'Eggues broke down, the cable having been destroyed by rust in the interior.

The elder Seguin, in the year 1840, had an opportunity to apply the old American method of stiffening suspension bridges, which he appreciated highly, as has been demonstrated. He was the first man, at least in Europe, who built a suspension bridge for railway purposes, and with full success.

His work was an auxiliary suspension bridge across the Soane river, built in the year 1840, when some spans of the wooden railway bridge were swept away. The two spans of his bridge were 137.5 feet each, the deflection of the cables was 16⅔ feet, girders 8⅓ feet high, composed of wooden beams nine inches by 2½ inches, and chords of 13 inches by 6½ inches, connected with the longitudinal beams of the floor by screw bolts, and kept in vertical position by braces, were to stiffen the floor vertically. The three cables on each side were connected by numerous ligatures. This new bridge was reported to have been as stiff as the former truss bridge, and was used as a railroad bridge during four years with perfect success, and then the remaining wooden frame bridge, as well as the suspension bridge, were replaced by a stone structure.

This bridge, also, had neither stays to support the floor, nor stays to add for horizontal stiffness.

Our Vice-President, Mr. Julius W. Adams, kindly showed me a plan of a stiffened railroad suspension bridge across Kentucky river, at Frankfort, which he passed over in the year 1852. It had been built some years previously, but precisely when, or by whom, he was unable to ascertain. It is possible that it was built before Seguin's structure. Besides this, it had also no stays. The spans of this stiffened suspension bridge were one hundred, two hundred and sixty-one, and two hundred feet, the lattice girder was six feet high, the distances of suspension rods, and likewise of the cross-bearers, equal to three feet, and floor with girders had the calculated weight of nine hundred and thirty pounds per lineal foot.

In the year 1842, the Austrian engineer, Schnirch, who built the well-known suspension bridge at Prague, proposed a new system of suspension bridges, the curves consisting of two pairs of parallel chains, one above the other, and both connected by triangular trussings. At these bridges the chains themselves represent a stiff inverted arch, and are to be calculated only as such. A bridge of this kind, before Schnirch had occasion to introduce his system in practice, was carried out in Switzerland, across the river Aar, near Aarau, but the distance of the chains was too small to be considered as sufficient.

Schnirch's plan was carried out for two tracks in Vienna, in the year 1861, to bridge a canal of the Danube river. As Schnirch's plan is of so old origin, and an ingenious invention; and, as the suspension railroad bridge in Vienna is, until this day, the best, though not the longest stiffened suspension bridge, I will proceed to describe it.

Two parallel chains on each side, consisting of alternately eight and nine link-plates each, are placed at a distance apart of 4.1 feet. The trussing consists of a single triangular system, the diagonals being 6.4 feet long, the links of the chains are ten feet long, and six by 1.35 inch, and six by 1.16 inch, respectively; two pairs of chains, in a distance of thirty-one feet from center to center, limit the floor sideways; four longitudinal trusses of wrought iron, consisting of uprights and crossing diagonals, are made to stiffen the floor and to offer suitable points of attachments to the suspension rods, at distances of about five feet. The suspension rods themselves are made adjustable. The longitudinal trusses are 2.5 feet high, and represent likewise the chords for a horizontal trussing, the uprights of which are the cross-bearers, iron girders of 2.5 feet height, and the diagonals are strong iron bars, fastened by rivets.

The span is two hundred and fifty-two feet; anchorage, architecture of piers, and performance are entirely successful.

Though this bridge has no great span, it is to be regarded as the best and most complete, in point of principle, of all existing suspension bridges. I therefore believe it is an act of justice to give a man of the originality of Mr. Schnirch the honor which he has a right to claim.

During this time the American engineers, occupied in improving the wooden truss bridges, did not forget to appreciate suspension bridges, and that they constructed the greatest spans, is well known. I mention the former Niagara bridge, of one thousand and forty-two feet span; Ellet's Niagara bridge, of seven hundred and sixty feet, and the unfortunate Ohio bridge at Wheeling, of one thousand and ten feet span. The latter, without any kind of stiffening, succumbed to a heavy hurricane in the year 1854. Stays would not have prevented this accident, for, under the same circumstances, stays were rejected at an early day of this century.

At the time when the Britannia tubular bridge was to be built, R. Stephenson proposed a stiff suspension bridge, in form of an iron tube, suspended by chains. Many and costly models were built, as at this time no theories existed, either of truss or suspension bridges. The tubes in these models were made stronger and stronger after every experiment; and, lastly, the chains were no longer necessary, and were dispensed with, and the iron tubular bridge was the result.

It is plain that the Niagara railroad bridge is the direct application of Stephenson's plan.

This work, as well as the Cincinnati bridge, are sufficiently known, and therefore I do not consider it to be necessary to describe them, nor to demonstrate that they are to be appreciated as great works of American enterprise and boldness.

Before finishing this short sketch of the history of suspension bridges, I have still to mention that the third possible arrangement to stiffen a suspension bridge was carried out in London in the year 1862 by the engineer Barlow, who bridged the Thames by three single spans, of two hundred and eighty feet each. This work is named the Lambeth bridge.

The said system consists of cables, horizontal beams and uprights, with diagonals between the cables and beams, so that these represent the chords of the truss work. This arrangement is the most objectionable of the three possible manners of stiffening suspension bridges.

The detailed construction, as furnished by Barlow, is unnecessarily complicated, and the tube, this favorite monster of English engineering, is not forgotten.

## *CRYOLITE AND ITS USES.*

BY DR. ADOLPH OTT.

The mineral cryolite was first discovered in 1825, by Giescke, at Arksutfiord, in West Greenland, where it occurs in veins of gneiss. It is found associated with pachnolite, iron pyrites, spathic iron, and galena. According to Bischof it is one of those secondary fluorides; from which it is probable that it originated from decomposed glimmer. It consists of 54.5 per cent Fl.; 32.5 per cent Na.; and 13 per cent Al.; and its chemical formula is expressed by $3\,NaFl + Al_2Fl_3$. Cryolite belongs to the trimetric system, like chiolite (of the form: $3\,VaFl + 2Al_2Fl_3$), chodneffite ($2\,NaFl + Al_2Fl_3$), and pachnolite (51.15 p. c. Fl, 17.44 p. c. Ca, 12.04 Na, 10.37 Al, 8.63 HO.), minerals very similar to it in its chemical composition. It is of a vitreous luster, a snow-white color, translucent and brittle; fusible in the flame of a candle, and before the blowpipe it is decomposed, fluate of soda being absorbed by the charcoal, while the crust of alumina remains behind. Its specific gravity varies from 2.816 to2.943.

Henry Rose, in Berlin, was the first who recommended the use of cryolite for the manufacture of aluminium, for which purpose it was then exported to a large extent, but only a few years since a variety of diaspor, called bauxite, was substituted for it, which is found in almost inexhaustible beds in Southern France. Cryolite is now chiefly employed for the manufacture of caustic, carbonate, aluminate, and bicarbonate of soda, and sulphate of alumina. In fusing the cryolite together with a certain proportion of silica, it forms what is called hot cast porcelain, a product recently introduced into market by the Atlantic Quartz Company, in West Philadelphia. In the Patent Record of the United States, we find also a mixture consisting of cryolite, silica, and borax, claimed for the welding of iron and steel.

For the production of carbonate of soda, cryolite is treated in the dry, but for the production of caustic soda in the wet way. Both processes are carried on to a large extent by the Pennsylvania Salt Manufacturing Company, in Natrona, on the Alleghany river. Thereby aluminate of soda results as an intermediary, and hydrate of alumina as a secondary product. The latter is generally converted into sulphate of alumina, a salt largely used as a mordant in dyeing and calico printing.

### MANUFACTURE OF CARBONATE AND BICARBONATE OF SODA.

For this purpose 1 eq. of cryolite and 6 eq. of limestone, both finely pulverized, are mixed intimately together, and exposed to the bright red heat of a reverberatory furnace. The process then going on may be expressed by the following formula: $3\ Na\ Fl + Al_2\ Fl_3 + 6\ Ca\ O,\ CO_2 = 6\ Ca\ Fl + 3\ (Na\ O,\ \frac{1}{3}\ Al_2\ O_3) + 6\ CO_2$; the carbonic acid evolved being gathered in a gas holder. The resulting salt-cake is racked out, placed in proper vessels and treated with water, in the same way as is done in the preparation of soda-ash. A lye is thereby obtained of aluminate of soda, and a residue of fluoride of calcium. The lye is then drawn off into a cistern and carbonic acid gas conducted into it.

The latter in combining with the soda, forms the carbonate of soda, which remains in the liquid, while hydrate of alumina is precipitated. In evaporating the liquid, the soda of commerce may be obtained; the abovementioned company, however, is now converting it almost wholly into the bi carbonate, by simply passing a larger amount of carbonic acid gas into the same.

### MANUFACTURE OF CAUSTIC SODA.

To this end, after having been finely ground, one eq. of cryolite and six eq. of slacked lime, or equal parts of both, are intimately mixed together. The mixture is then exposed to heat, the resulting mass treated with water, and the lye thus obtained, allowed to boil with a surplus of cryolite. Fluoride of sodium and hydrate of alumina are thus formed, as is shown by the following equation: $3\ (Na\ O,\ \frac{1}{3}\ Al_2\ O_3) + (3\ Na\ Fl + Al_2\ Fl_3) = 6\ Na\ Fl + 2\ (Al_2\ O_3)$.

The lye of fluoride of sodium is drawn off from the insoluble alumina and boiled with caustic lime. Fluoride of calcium and caustic soda are thereby obtained. The latter having been decanted from the former, and submitted to evaporation, constitutes the concentrated lye of commerce.

It is very desirable that the lime employed be free from oxide of iron, in order that pure sulphate of alumina may be obtained, as the smallest percentage of that oxide diminishes the brilliancy of the colors formed by the alumina compound.

### ALUMINATE OF SODA.

This compound is sold by the Pennsylvania Salt Manufacturing Company, in a concentrated state, under the denomination "Natrona Refined Saponifier," for the making of soap. It forms, further, an excellent mordant for imparting aniline red and violet colors to cotton. For this purpose the fabrics are first treated with a solution of caustic soda lye of from 4° to 5° Baumé left therein from ten to twelve hours, then immersed in a solution of the aluminate, and finally in one of sal ammoniac.

### FLUORIDE OF CALCIUM.

The residue obtained in the manufacture of caustic, and carbonate of soda forms a valuable flux for the reduction of iron ores. It prevents the formation of graphet, and attacks the furnaces far less than limestone, the usual flux. The iron is not only purer, but of a finer grain, and gives sharper castings. Fluoride of calcium has also been employed in the reduction of gold and silver ores. To this end, its hypothetical, is, however, altogether beyond its real practical value. A slight advantage in its use, over the ordinary flux, might, perhaps, under proper conditions, be obtained in the smelting of very silicious ores.

### HYDRATE OF ALUMINA—OTHER AND NEW USES.

Hydrate of alumina, when heated with saltpetre, decomposes the same—forming thereby nitric and hyponitric acids, and aluminate of soda. The mixture of the two gases may be converted into commercial nitric acid by the process proposed by Kuhlmann, and the remainder may either be used by itself, or transformed again into soda and hydrate of alumina.

The latter may be employed further for the disintegration of heavy spar. For this purpose the spar is mixed with the hydrate and carbonaceous matter, and exposed to a red heat until decomposed. By lixiviating the resulting mass with water, we get a solution of aluminate of baryta, from which we can, by partly neutralizing the liquid with muriatic acid, obtain chloride of barium, a compound largely used for the whitening of paper collars.

It is proposed to use the hydrate of alumina in the desulphurization of gold and silver ores. It is a well known fact that the decomposition of the sulphates in the roasting of these ores requires a high temperature. The disadvantage connected therewith consists not only in a waste of fuel, but also in the melting together of the non-oxidized sulphides, which as they no longer present the same large surface to the air, require, comparatively speaking, a a much longer time, and, in consequence thereof, a much greater quantity of fuel in order to become perfectly oxidized. An admixture of hydrate of alumina, as obtained in the above described process, or even an addition of clay soil, however, readily decomposes those sulphides, and at the same time, forms a very porous mass, exceedingly favorable for the absorption of oxygen.

### SILICO-FLUORSODIUM.—(3 Na Fl, 2 Si $Fl_3$.)

In precipitating a solution of fluoride of sodium with fluosilicic acid, we obtain a gelatinous and almost transparent deposit, which I propose to use as a fertilizer. Too little attention has hitherto been paid to fluorine, and its compound, as a fertilizing agent in the growth of plants; and to its general absence in cereals, we may, perhaps, attribute the decay of teeth, so common in our day. Fluoride of calcium forms the enamel of our teeth; it represents a constituent part of our bones, and has been found by the French physiologist, Nicklès, not only in the blood of man, but also in that of birds and mammiferous animals. Silico-fluorsodium may be produced cheaply from the fluoride of sodium which results from the manufacture of concentrated lye, and its elements can scarcely be presented in a more soluble and convenient state than in this compound. Adjourned.

## January 23, 1868.

Prof. S. D. **Tillman** in the chair.

The following notes on science were read by the Chairman:

### CHELIFERS.

Mr. S. G. McIntire read a paper before a London Microscopical Club on the haunts, habits and modes of capturing these curious little animals, which resemble minute scorpions, and move backward and sidewise like the crab. The chelifer is found under the bark of trees, and in houses among old papers. They feed on the insects which are so destructive to libraries. Fifty-four species of chelifer are now known.

### CRYSTALIZATION OF SUGAR.

Dr. Shreiber having stated that the salts in molasses, especially the nitrates and chlorides, did not check crystalization, M. Payen made some experiments in that direction, and reported to the French Academy, that nitrate of potash does not hinder the formation of sugar, but that chloride of potassium does retard crystalization, and common salt acts more powerfully in a similar way.

### POWDER MAGAZINES.

The destructive effect of the late explosion of nitro-glycerine near Jersey city, has turned attention to the importance of providing a suitable place for the storage of explosive compounds. Mr. Mallet, in commenting upon the Erith powder explosion, expresses the opinion that great destruction is not likely to be caused by the propagation of the shock of an explosion through the earth, except within a very limited area. To protect the neighborhood against the aërial wave, he suggests the construction of a permanent circular travers or bank, at such distance, and of such inclination as not to be shaken by the earth shock of an explosion, and raised high enough to shield buildings without; in other words, that the position of the magazine should be at the center of an inverted conic frustum.

### THE EFFECT OF SOUND ON WATER-JETS.

We noticed, not long since, the beautiful philosophical experiment which illustrates the effect of sonorous vibrations on the ordinary gas flame. Prof. Tyndall, of the Royal Institution, London, has repeated on a large scale an experiment of Savart's, showing the influence of sonorous air-waves on a jet of water. Water was discharged obliquely from an ordinary gas burner. By the aid of an electric lamp, a shadow of the vein, as it broke into scattered drops, was thrown upon a large white screen. On sounding an organ-pipe, or a steel tuning-fork of proper pitch, the drops would reunite in a continuous stream, and form on the screen a band several feet in length. When the sound ceased, the vein again broke into drops. The minuteness of the force required to produce this effect was shown by placing a tuning-fork, just after its vibrations had ceased to be heard, against the support of the nipple from which the water issued, when the drops would instantly coalesce. The jet was equally sensitive to beats, and the eye and ear gave proof of a perfect synchronism.

### FUNCTIONS OF THE ROOT.

M. Corenwinder read the memoir before the French Academy of Sciences on the functions of the roots of vegetables, in which he concludes from experiments made by him that the root does not obtain, by absorption, all the carbonic acid found in it. On putting the roots in communication with a certain proportion of this acid, either in a gaseous state, or in solution in water, he invariably found the quantity present in the roots greater than that which had been supplied to the plant.

### EXTRACTION OF OILS.

It is said a large number of German houses are extracting oils by means of bisulphide of carbon. The quantity of oil obtained by it is reported to be from five to eight per cent more than can be made by the hydraulic process; and as the refuse contains more nitrogen than the ordinary oil-cake, it is more valuable as a manure.

### GAS FROM A VOLCANO.

M. Fonqué succeeded, after great trouble, in collecting some of the gas which arose from the sea during a volcanic eruption at the Azores, in June last, which he has since found to be free from carbonic acid, and rich in oxygen.

### SINGULAR EFFECT OF LIGHTNING.

Sir David Brewster has published a description of the manner in which a stack of hay was struck by lightning in Forfarshire. The stack was on fire, but was extinguished before much of it had been consumed. On examining the stack, a circular passage was observed, which extended to the bottom, and terminated in a hole in the ground. In the hole was found a foreign substance, which proved to be silex, obviously formed by the fusion of the silex contained in the outer coating of the hay. It had a greenish tinge, and contained burnt portions of hay.

### VENTILATION.

The House of Commons required during last session 2,500,000 cubic feet of air per hour for its proper ventilation. The original plan of taking the supply of air from a great height, viz: from the clock tower, has been given up, because it was found that London air at this altitude is not as pure as that nearer the earth. The supply is now drawn from the Star Court and the Commons Court. When discharged into the great hall, it has an average temperature of sixty-two degrees F., except in very hot weather, when the velocity of the current is increased to counteract in part the elevation of the temperature.

### SPURIOUS SODA.

The carbonate of soda sold by druggists under the name of "washing soda," is frequently imitated in England by means of sulphate of soda, in the following manner: The ordinary "salt cake," made by the Leblanc process, which is sulphate of soda, is dissolved, and if it shows acid, is neutralized by a solution of lime; soda ash, equal in weight to twelve per cent of the salt cake, is then added to the solution. After the liquid has settled it is drawn off, and large, hard crystals are formed, which may be made still larger by increasing the quantity of soda ash. One ton of salt cake will make nearly two tons of the adulterated article.

### THE FALL OF LEAVES.

M. Frécut, in a paper presented lately at the French Academy, calls attention to the phenomenon that occurs just before the fall of the leaf, and which is not unlike the process which accompanies the shedding of horns in animals. It consists in the obstruction of the vessels at the base of the petiole or foot-stalk, which is effected by the multiplication in the parietes of the vessels until they are completely choked up in the neighborhood of the insertion of the leaf, although the other portions of the vessels retain their normal condition.

### PEPPER'S GHOST.

This spectral appearance, produced by a transparent mirror in a sliding frame, partially reflecting the rays of a strong Hare light thrown on the person who, beneath the stage and out of sight, plays the part of the ghost, and which for several years in London and one season in New York attracted large houses, has been of late the subject of an angry controversy in *The London Mechanics' Magazine.* From it we learn that Mr. Henry Dircks, and not Mr. Pepper, is the inventor of the mechanical combination for producing an optical illusion on the stage, like that which may be seen on a large scale in the splendid window panes of Broadway, under a mid-day sun.

### *HOSE COUPLING.*

W. H. Haight exhibited Mr. Gifford's hose coupling, which obviates the use of a screw. This coupling has on one of its pieces a slot and inclined plane into which a projection on the other piece is inserted. By means of the inclined plane the parts of the coupling are brought together with any desired closeness. The whole work of uniting the coupling is done by one motion and without turning the parts once around. The advantage claimed for it is expedition and the certainty of a tight fit. The coupling has stood a pressure of 950 pounds per square inch.

Dr. Adolph Ott read the following paper:

## *ON THE SWEET PRINCIPLE IN FROZEN POTATOES.*

It is a well known fact that the nutritious root of *Solanum tuberosum* is getting sweet in freezing, and especially is this the case when it has been exposed to cold for several times. The supposition was made, that this change might be due to the conversion of the starch of the potatoe into sugar, but I neither know of this hypothesis being verified, nor am I acquainted of it ever being attempted to be explained. It remains to be decided also whether sweet principle exists already in the raw, or but in the boiled root. To decide upon these questions, I exposed one pound of this vegetable to the cold of a severe winter night, and when they were thoroughly frozen, I reduced first, one-quarter of a pound of them to a fine pulp, in a rasping machine, pressing the sap through a flannel; from this I measured 100 cubic centimeters (3.38 fluid ounces), added to them ten per cent of a solution of basic acetate of lead, shaked the mixture well and filtered it finally through coarse blotting paper. The clear liquid was transferred in the glass tube of Mitscherlich's polarimeter, and the same interposed between Nichols' prisms. There was, however, no rotation of the plan of polarization to be noticed, and thus the fact was ascertained that no sugar is present in raw frozen potatoes.

For the purpose of deciding whether sugar is produced in the process of cooking, I steamed 250 grammes of the vegetable for one hour, crushing them afterwards with 200 cub. cent of tepid water. The thus obtained solution was divided in two portions, one of them was set aside, and from the other I precipitated gum and protein matters, with sub-acetate of lead, in discoloring also the reddish-brown liquid perfectly with a few drops of oil of vitriol. In filling the same in the sugar tube, and rotating the analyser of the polarimeter to its left, a change of color was instantly observed, thus indicating the presence of uncrystalizable sugar. No calculation, however, was made from this rotation, as the rotation of the uncrystalizable or fruit sugar to the left is compensated by dextrine and other substances, which are right handed with respect to polarized light, they being generally the product of the action of heat upon albuminous starchy matter.

I therefore made recourse to Fihling's test, in using the infusion of the boiled potato, which had been set aside. Then the following two elements were determined: 1. The percentage of sugar in the infusion. 2. The amount of water in the boiled potato.

From these the percentage of sugar in the latter was calculated; it was found to be 1.45 per cent. What is the cause of that sweet principle ? We will try to answer this question. In freezing and thawing, the sap of the potato bursts the cells and thus puts an end to vitality; at the same time decomposition is setting in, which, though retarded by the cold, will nevertheless not be arrested entirely—the more as the atmosphere at this time, especially during snow-falls, always abounds in that powerful oxydizing agent, ozone. No doubt that the albuminous matter which is contained in the outmost layer of the starch grains will first be attacked by it; and is it not very probable that they will thus be transformed into that peculiar substance called *diastase*, a body which as we know possesses the same power as dilute acids of converting a proportionally larger quantity of starch, first into dextrine and then into sugar, when exposed to a temperature of from 140 to 169° F.? This is completed in cooking. Wheat probably contains enough diastase, as every seed does when sprouting, to convert all its starch into dextrine and sugar; not so the potato, but still it contains enough to form so much sugar as to give it that well known peculiar sweet taste. Adjourned.

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## January 30, 1868.

Prof. S. D. Tillman in the chair.

The Chairman presented the following notes on science:

### BLACK PEPPER.

The black pepper tree has been brought to bearing maturity in California.

### VOLCANIC FLAMES.

Janssen, by spectroscope analysis, has found that the flames of the volcano at Santorin, give evidence of the presence of sodium, hydrogen, copper, chloride and carbon.

### NEW COLLODION PAPER.

Obernetter, of Munich, has brought a silver collodion paper in the market, far more sensitive than ordinary silvered albumen paper, which makes it of more service to the photographer during the winter months.

### MOTHER OF PEARL CARDS.

The sale of these beautiful visiting cards has been forbidden by the municipal authorities of Munich, it having been shown by chemical analysis that they contain a soluble salt of lead, which, being poisonous and sweet, would be dangerous in the hands of children.

### RECOVERING INDIGO FROM RAGS.

A French inventor's process consists in placing rags in a boiler provided with a double bottom, and saturating them with a solution of caustic soda of the strength indicated by one degree Baumé. The rags are then subjected to the action of steam at forty-five pounds pressure to reduce and dissolve the indigo, which is afterward precipitated from the soda solution and collected in a pure state.

### IODINE AND PHENIC ACID.

Dr. Percy Boulton has removed the objection to the external application of a solution of iodine as a cure, on account of the discoloration of the skin, by adding to it a few drops of carbolic or phenic acid, one of the most efficient disinfecting agents now known. This mixture is not quite colorless, and is said to be a sovereign remedy for the sore throat, abscess in the ear, and similar painful diseases. Dr. Boulton's recipe is as follows: Compound tincture of iodine, 3 grammes; pure liquid carbolic (phenic) acid, 6 drops; glycerine, 30 grammes; distilled water, 150 grammes.

### PONDERABLE MATTER THE ONLY MEDIUM OF ELECTRICITY.

Mr. Alvergniat, of Paris, has constructed a new apparatus for proving that electricity cannot pass through an absolute vacuum. Two platinum wires are inserted into a tube so that their free ends are within about an eighth of an inch of each other. The air is then exhausted from the tube by means of a mercurial column, after which the electric spark will not pass from one platinum wire to the other.

### DEATH FROM MARSH GAS.

Dr. B. W. Richardson, has made some experiments with light carburetted hydrogen, known among miners as fire-damp, to ascertain what percentage in air would be fatal to the animal breathing it. He found that pigeons could live about half an hour in air containing thirty-five per cent of that gas. The diminution of circulation and respiration was so gradual that it was difficult to determine the exact time when death ensued.

### PARHELIA.

The inhabitants of Lee county, Va., were lately quite excited at the simultaneous appearance of three rising suns, which some of the more ignorant regarded as an omen of coming evil. The true sun was surrounded by a beautiful colored halo; above this was another partially developed halo, beneath which two mock suns were visible for a short time. The phenomena of colored halos are due to the refraction of light by frozen particles floating in the atmosphere at a great height, while the white or uncolored parhelic circles arise from reflections. They are never seen unless the *cirrus* or *cirro-stratus* cloud intervenes between the sun and the observer

### TRANSFERRING CARBON PRINTS.

Dr. H. Vogel of Berlin, gives, in *The Philadelphia Photographer*, Swan's process for transferring carbon prints. A solution of gelatine one part, water eight parts and glycerine one-fourth of a part is first made, in which the pictures are completely immersed along with a piece of fine tissue paper. They are taken together out of the solution, when they will adhere quite firmly to each other. They are now dried, and with benzine it is easy to separate them from the fine paper and paste them, or else paste the whole on cardboard and then separate. Dr. Vogel has also made some successful attempts to transfer carbon prints to glass. For this purpose the developed carbon print which still rests on the caoutchaouc paper, is floated on a solution consisting of gelatine twelve parts, glycerine three parts and water one hundred parts. Next on the warm plate of glass a little of the above solution is poured; the picture is laid on this, and the surplus of the gelatine is removed by pressure with the fingers; when nearly dry the picture is brushed over in order to tan it, with a solution of one part of chromate of iron in three hundred parts of water; after this it is allowed to dry completely, and is then by means of benzine, dissolved off. On opal glass these pictures are very pretty, particularly when the tissue is of a brownish tone. These positive carbon prints on glass may become important in the future, for it is easy to make from the positive carbon print on glass a negative carbon print on glass also, and thus we would have the means of supplying negatives and giving the latter a permanence equal to the carbon print.

### UTILIZING WASTE COAL.

Carefully conducted experiments have been made by a board of engineers, appointed by the Navy Department, to examine into the various methods of employing anthracite and bituminous coals as fuel, at the works of Messrs. Whelpley and Storer, East Boston, Mass. A furnace for burning pulverized coal was there erected, which the owners have used for several years in their ingenious process for the reduction of metallic ores. No official report of the combustion trials made with this furnace has yet appeared, but the results may be briefly stated. A series of experiments, each lasting forty-eight hours, showed the relative heating power of bituminous coal in lumps of four inches cube, burned on a grate with a forced blast under an ordinary tubular boiler, and the same kind of coal, oue-third in lumps burned on a grate, and two-thirds slack pulverized, and driven in above the fire with a forced blast. Under conditions as nearly as like as practicable it was found that an average of one pound of lump coal evaporated eight and a half pounds of water from a temperature of one hundred and forty degrees Fahrenheit, while one-third of a pound of lump coal and two-thirds of a pound of pulverized coal evaporated nine and a half pounds of water from the same temperature. The combustion was so perfect that in neither case was the residual ashes more than eight per cent of the coal used. In the latter part of the experiment the increased useful effect of pulverized coal over lump coal rose from twelve to thirty per cent, owing to the acquired skill of the fireman in increasing and regulating the heat. Assuming that the heat generated by pulverized coal is barely equal to that of lump coal, these experiments solved most satisfactorily the question what is to be done with the vast quantity of fine fuel which now lies at the mouths of coal mines in this country and in Europe. Statistics show that while the mines of Great Britain yield more than 100,000,000 tons of marketable coal per annum, about 30,000,000 tons more of waste coal are left at the mines, The percentage of waste coal at the anthracite mines of this country is somewhat less than at the bituminous coal mines, yet it has been estimated at about twenty-five per cent of the whole weight brought to the surface. The utilization of this waste coal would virtually add one-third more to the value of the annual product of American mines, and eventually cause a corresponding diminution of the prices paid by the consumer; therefore it may be safely averred that no improvement has been lately proposed which compares in general importance with that which would make available the waste product of coal mines. The inventors of this process of utilizing fine coal are about applying their apparatus to locomotives.

Previous experiments have demonstrated that at least one-third of the air required for combustion should be admitted above the fire in the locomotive, and the remaining two-thirds under the grate-bars. Still, the waste resulting from rapid and imperfect combustion required in the locomotive is very large. It is claimed that by pulverizing coal and admitting it in combination with air above the ordinary coal fire, the rapid generation of heat is successfully accomplished; and what is still more important in the locomotive, that there is an almost entire absence of smoke and particles of unconsumed coal, which in spite of spark-arresters, have been thus far the disagreeable and dangerous resultants of accelerated combustion. The trials to which we have referred relate only to bituminous coal. It would be interesting to know whether the same advantages can be gained by pulverizing anthracite, which requires a much higher degree of heat for its ignition.

## *PROPOSED IMPROVEMENT OF NEW YORK HARBOR.*

The Chairman said, I desire to lay before the Polytechnic my plan for avoiding the dangerous navigation in the East river, at Hell Gate. Instead of expending five million dollars in removing rocks from the bed of that river, the Government may, for a smaller sum of money, construct a ship canal between Flushing bay and Jamaica bay, and the action of the tide will soon deepen the Jamaica inlet, so as to make a passage for ships into the lower bay; or we may close that inlet and deepen the creek that separates Coney Island from the main land, thus allowing vessels of the largest class to pass into Gravesend bay, and thence into New York bay. The distance from the east shore of Flushing bay to Castle Garden, or the mouth of the Hudson river, by the new route, would be about double that by way of the East river. Without taking into account the length of the channel required to be deepened, we may estimate the length of the new canal at from five to six miles. Of this, one-half of a mile would be a deep cutting through the dividing ridge of Long Island, which here has an elevation of not over one hundred feet above the level of the sea. The earth required to be removed would be worth more than the cost of its removal, for filling in and forming a dock frontage along the new channel, which would bring into immediate use for commercial purposes several square miles of land. Probably no rock would be encountered on the whole route, and the work of removing the earth and forming embankments could be done, for the most part, by steam engines.

A channel thus formed between Long Island Sound and the lower bay, would greatly increase the quantity of water passing between the Sound and the Ocean. The mouth of such a channel would not close, but would continually enlarge from the same causes which have closed the northern and enlarged the southern inlets of Barnegat and other bays along the Atlantic coast.

By the consummation of the proposed improvement, Brooklyn would become an important part of the great metropolis. The land lying between the new channel indicated and the East river, includes all of Kings county and part of Queens; its area is six or seven times that of Manhattan Island, and the whole of it is nearer the New York city hall, postoffice, and custom house than the present northern limits of the city.

The whole expense of the proposed improvement would not exceed ten per cent of the increased value given to land bordering the new route, and it might be defrayed by the sale of the vast number of city lots which could be made by narrowing the East river, below Blackwell's Island, to one-quarter of its present width. Closing that river completely, by extending Forty-eighth street from New York to Hunter's Point, would obviate the evils arising from strong tidal currents, and form below a safe harbor free from floating ice during the winter season. However, should sanitary considerations be opposed to the measure, there could be no objection to greatly reducing the width of the river below Forty-eighth street. Broad bridges could be built from New York to Brooklyn Heights, which, at the east end, would be high enough to permit ordinary river steamers to pass under them, and a draw in each could be provided for the passage of ships on their way to the United States Navy Yard, or some of the neighboring piers, it being understood that ships bound to sea would pass through the new channel into Long Island Sound. A grave question is soon to arise as to whether the progress of hundreds of thousands of people, on foot, in carriages, and in cars, is to be imperatively stopped at an arm of the sea for the passage of a single sloop carrying two or three persons. At Chicago, where there are already more than a dozen bridges over the river which forms its harbor, the draws are only opened at certain intervals and are not allowed to remain open beyond a certain number of minutes. Let us look forward twenty years, when MANHATTAN — embracing New York and its present suburbs—will contain more than three million of inhabitants, one-third of them residing on the east side of the East river. Will those citizens consent to be delayed on either shore by the passage of vessels which might be compelled to navigate the East river during the night, or the new channel to the sound during the day? Every improvement made for the navigation of the East river only aggravates the evil now complained of, and makes still wider the barrier between New York and Brooklyn. The mass of our business men cannot reside in Westchester county. They must be accommodated with dwellings in Brooklyn, or they will go to Jersey city, which has already the advantage of embracing the termini of the great Southern and Western railways and the docks of the most important lines of ocean steamers.

It is possible that a single suspension bridge in connection with the present ferries may satisfy the wants of Brooklyn for a few years, but the time is surely coming when the great crowd of business men cannot be accommodated by these channels. Free bridges, with markets on either side, will eventually be made. The tonnage of our Metropolis, even as far back as 1860, exceeded that of any other port in the world. New York will very soon be the financial as well as the commercial center. True foresight must favor a scheme which makas more accessible fifty square miles of land, giving to the most distant parts a valuable water front, and providing for the expanding Metropolis ample room and verge enough for the next half century.

### *HAIR DYE.*

Prof. Vanderweyde said the time has come to protest against the use of pernicious hair dyes. All those preparations which claim that they color the hair by long use, and yet are not technically hair dyes, contain, as far as he had examined, lead in some form. Any preparation of lead, with which the head is wet, must be followed sooner or later with painful results. In some cases the effect is felt immediately, in others long use is required to produce injury. Cases of neuralgia, and even paralysis, are now quite common, the cause of which can only be traced to the use of lead preparations. White lead (carbonate of lead) was formerly used to whiten paper collars, but after its evils were made known, the carbonate of barata was substituted. It is not long since a child died in Pennsylvania from eating a portion of a paper collar. He had found on analyzing a common visiting card that it contained acetate of lead.

Dr. N. H. Barbour read the following paper:

## STEAM BOILER—ITS DEFECTS AND THE REMEDY.

*Mr. Chairman, and Gentlemen of the Club:* In presenting to your consideration, a subject, to which so many men have devoted their lives, I will not dwell on its importance.

During the last fifty years, there has been no other branch of mechanics, to which so much time, money and engineering skill has been directed, as to this one subject of evaporation, and yet, how meager the results, especially in three of its most important features, viz: economy in fuel, economy in weight, and economy in the life and limbs of mankind.

Vigorous and persistent efforts have also been made to accommodate steam power to agriculture, and yet, in this almost boundless field of labor, we are still, like the ancient Egyptians, compelled to use the ox, the ass and the horse, to scratch a few inches of the top of the soil.

Why is it, that in this boasted nineteenth century, we make no progress, absolutely none, in a matter of such vital importance as the application of steam to the cultivation of the soil? The horse plow, turning a few inches of earth, cannot cheat nature into her best endeavors, for the immutable law of quantity or time must still control; scrimp her in material, and she will attenuate the burden of one year over many years; give her generous means, and you shall have quick and abundant returns.

We all know that the immediate reason why the steam engine cannot be used to advantage on the soft soil of the farm, is owing to its excessive weight. And yet, a fifty-horse engine consumes only a half pint of water at each stroke; and this water is supplied by the feed-pipe as fast as required, and at the full temperature (or might be); and to evaporate this little quantity, requires tons of water and iron, making a great volcano, laboring to bring it forth.

There must be a radical error at the very foundation of our system of evaporation, or the ten thousand devices, making a great noise of onward movement, would surely have been more successful. Let us carefully examine and see if our efforts are in the right direction; if they are founded on scientific data, otherwise we may spend another fifty years as fruitlessly as the last.

It is evident that in order to obtain maximum results, the heat must not only be absorbed at the immediate point of combustion, but every inch of the evaporating surface must be maintained at the highest favorable temperature. And I can demonstrate, that under such conditions, one square foot of surface would be as efficient, as is the two hundred square feet of an ordinary fifty-horse boiler, and I believe that I shall be able to satisfy you that such, or nearly such, results are attainable.

But do not let your attention be disturbed by supposing that I am about to propose making steam in small tubes, or upon flat surfaces, or in any other of the thousand and one ways already tried and found wanting, for as I told you at the first, I shall propose an entirely new principle as applied to the steam boiler. But first, we will learn what a given metallic surface, under the most favorable conditions, can accomplish, and having placed our mark high, endeavor to come as near to it as the known laws of mechanics will admit.

You are aware that flame cannot pass through the meshes of wire cloth (this is the principle of the safety lamp), not because it offers resistance to the gas, but the metal absorbs the caloric so rapidly that the temperature is reduced below the point of combustion, before it has time to get through; and if these wires were tubes, through which a stream of water was constantly passing, the heat would be so much the more readily absorbed.

We see then that a surface can be so arranged as to absorb caloric as fast as an equal area of combustion can generate, or at least very nearly so.

In some of our locomotives, a hundred and fifty pounds of coal per hour are consumed on a square foot of grate. This is equal, in actual practice, to the evaporation of more than a thousand pounds of water, or fifty-horse power. Put these two facts together, and a fifty-horse boiler should, when perfect, have one square foot grate, one of evaporating surface, and a steam dome. We will now compare a tubular boiler (the best form known at present to the profession), and see what percentage of its evaporating surface accomplishes this maximum amount of duty.

The steam, formed at the bottom, is converted into mechanical motion in the boiler, and lost, as I will illustrate. Take a vessel of water several feet in depth, representing a section of our boiler, and apply heat to the bottom until it boils fiercely, you will find that very little, if any, evaporation takes place beyond that due to atmospheric absorption. It takes some force to keep a body of water in rapid motion, and more especially when it is under a pressure of ninety pounds steam, equal to another column of water two hundred feet high. Now, pour a little water into the bottom of the vessel, apply the heat, and a column of steam will flash up to the ceiling, and you will evaporate more water thus in a few seconds than in as many minutes in the former case. You will say that the steam formed at the bottom promotes circulation in the boiler; that is true, but it is equally true that if the water were not there, circulation would not be necessary.

You may plug up the lower half of the tubes in a boiler, and then make as much steam as before. An engineer recently stated on this floor that he had tried this experiment on a locomotive, and after closing one hundred of its one hundred and sixty tubes, made more steam than before. This is perfectly philosophical, for the heat which had before passed through the lower tubes, and was converted into mechanical motion in the boiler, is now driven to the top, and utilized as steam. Hence we will wipe out the lower half of this boiler as being a little worse than useless.

It is well known that flame cannot enter a tube of less size than the body of the flame itself, because, when the air is excluded from its surface, combustion ceases. It is also well known that hot air or gas imparts caloric principally by contact, and in its rapid passage only the outside stratum of air touches the tube, hence little of the heat is absorbed, and as a consequence, we find that the first few inches of a boiler tube make more steam than all the remainder, whatever may be its length. So we will dispense with the greater part of these upper tubes as being nearly worthless, leaving only a few inches of them, together with the crown sheet; and here we have the part of the boiler which makes nearly all the useful steam. But unfortunately this part is too far from the fire, as you can see, to be of much service, so we will wipe it all out, as not a single inch was under circumstances where a maximum evaporation could follow; and probably more than fifty per cent of the little actual evaporation exerted its full equivalent of work in the boiler without ever reaching the engine. What wonder, then, that we only utilize ten or twelve per cent of duty from the fuel.

It being evident that flame or hot air cannot be used to advantage in conveying caloric from the furnace to the distant parts of the boiler, we must look for some better medium; and it is in steam itself we find the very elements of success. This may, at first, appear paradoxical, but I am convinced that if we are ever successful, it will be in this direction. There is no other medium so well adapted for transmitting heat. The cylinders of a large marine engine, measuring a thousand cubic feet, will discharge their contents thirty times a minute into a small condenser, which will, even then, maintain a very perfect vacuum. The amount of heat conveyed by the steam from the ten or twelve large boilers, and transferred to water in that little condenser, is almost incredible, for if represented in mechanical force it would be equal, each minute, to 840,000 horse-power.

The reason why steam gives up its caloric with such amazing rapidity is, that when the outside particles come into contact with the condensing surface, they instantly condense and make room for the next, and so on, until the last particle has rushed against the sides, with as much speed as if there had been a vacuum between them.

I propose the following plan for a steam generator, viz: One end of a large number of small tubes so arranged as to present a large surface near to the fire, which, like the wire cloth, will rapidly absorb the heat. The opposite end of the tubes are inclosed in the steam generator. These tubes contain a little water, the air is expelled, and they are hermetically sealed so that the water in them always remains there, and when cold, has a vacuum over it. When this water, in the lower end of the tube, over the fire, is converted into steam, the heat is instantly conveyed to the opposite end inclosed in the generator, every inch of which will be kept at the precise temperature of that which is over the fire. These tubes are so near together in the generator, that only a thin stratum of water surrounds them, and this is supplied at a high temperature, by the feed-pipe, in the usual way. I presume most of you are aware that the temperature at which these pipes will be maintained, that of high pressure steam, is the one at which water is the most rapidly converted into steam; if not, try the following experiment. Heat an iron vessel red-hot and then carefully introduce a little water. It will move around over the hot metal without coming in contact, and evaporation will be very slow. Pour out the water, and when the vessel has cooled down to 500° renew the experiment and nearly the same results will follow, only there will be a little more evaporation, because the vapor upon which the water rests is less rarefied. Now let it cool to 330°, pour in the water and it will flash into steam in a few seconds.

Three hundred and thirty degrees (varying a little for variation of pressure), is the point at which water is by far the most rapidly converted into steam; and that maximum point, varying with the pressure in the generator, is the precise temperature at which every inch of our evaporating surface will be maintained. It cannot be otherwise, for the pressure, and hence temperature, in the hermetically sealed tube will be controlled entirely by the temperature, and corresponding pressure, in the generator, because condensation is more rapid than evaporation, and hence all the heat which can be made to enter the end of the tubes which is over the fire is instantly disposed of in the generator, subject to the above conditions.

Here, then, we have a theoretically perfect boiler, with every part, at the exact temperature required, although that temperature is a variable one; for when the pressure in the boiler is high the temperature of the heating tubes will also be high, simply because they can then become hot; but when the pressure in the boiler is low, the film of water which surrounds the tubes abstracts their heat so rapidly that they can only maintain the equilibrium, and hence the boiler can never by any possibility become colder or hotter in any part than is due to the pressure of steam it is carrying.

I have endeavored to explain some of the defects of our present method of evaporation, and have demonstrated that much of its surface is necessarily useless. That the great body of water, involving an extended surface, maintained at a fearful risk, is not simply a nuisance, but a definite evil, swallowing up the mechanical effects of the fuel, far beyond what is generally supposed. If a very large part of the heat is not resolved into mechanical motion in the boiler, the question, what does become of it, must remain unanswered.

The plan here proposed, appears to be free from all of these defects. It is the most effectual way to utilize the heat from the furnace. It is the only way to maintain the desired temperature equally throughout the whole generator. It is light, comparatively inexpensive, and absolutely free from danger. And if it does not attain to the above theoretical results, it is evidently more efficient than are the boilers now in use, especially on the farm, where simplicity and absence of weight is a necessary element of success.

I have already constructed a boiler on the above principles, and with considerable success. It weighs thirty-five pounds when fully charged for work, and with a moderate fire evaporates a cubic foot of water per hour under ninety pounds steam. And although far from perfect, in its mechanical details, still I am persuaded this is the direction from which we may reasonably hope for success in rendering this great engine of civilization a comparatively cheap, safe, and useful servant of the soil.

After considerable discussion on the generation of steam, the Association adjourned.

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### February 13, 1868.

**Professor S. D. Tillman in the chair.**

The attendance at this meeting was somewhat extraordinary; usually the room has been filled on Thursday evenings, but on this occasion not even standing room could be found long before the meeting was called to order. The Chairman introduced the Hon. Wm. J. McAlpine, C. E., formerly State Engineer, who read the following interesting paper:

### *ON FOUNDATIONS.*

An eminent engineer and author says: "The permanence of engineering structures depends almost entirely on the manner in which their foundations are laid; when these are properly made, the superstructure is more a matter of taste than of skill. Many structures have been destroyed in consequence of defective foundations, while comparatively few have failed from an unskillful construction of the works above them. It is mortifying to admit that the foundations of modern engineers, architects and constructors fail more frequently than those of their predecessors. I shall avoid mentioning particular cases of modern failures, of this kind, but one cannot read the publications of the day, nor examine the works built, nor hardly enter a friend's house, without noticing such failures, and when they are avoided it is often done at a large extra expense which a proper knowledge of the subject would have saved. I address myself especially to those of my own profession, but the principles involved in the discussion of the subject, equally apply to architects, and to a class of practical men who, without study, undertake similar works and whom I have designated as constructors. Nor will the solution of these questions, I hope, be less interesting to those who furnish the money to build them.

It is generally supposed that an unyielding foundation must in all cases be obtained, and when this is practicable, at not too great a cost, it is advisable to secure it; but the failures to which I have alluded, more frequently occur from subsequent changes, beneath the superstructure, or from irregularities in the support which the foundations afford at different places.

A foundation on durable rock may be regarded as perfect, but even in this case, care must be taken to avoid placing a heavy structure upon steep sloping surfaces upon which it may slide, unless it is prevented by benching down the rock in horizontal planes.

Foundation masonry below ground is usually of a less compact character than that above, and if, as often occurs, the rock is found at a much lower level at one place, than it is at an adjacent one, the unequal compacting of such masonry of different thicknesses will injure the works resting upon them. Hard compact earths are considered good foundations; under heavy pressure they may be somewhat compressed, but if this is uniform no injury ensues; when saturated with water, this compression will be greater, and there is sometimes danger that the saturation will occur, in one place and not adjacent, and thus produce an unequal settlement.

Gravel and sand also afford good foundations, but are more liable to escape laterally, and allow the structure to settle.

Loam, silt and other light soils are so compressible that where they occur it is usually necesary to construct an artificial foundation.

The most difficult case, and one of common occurrence, is to provide a proper support for a heavy structure, when the natural material is not uniform, under all portions of the foundation; and this requires the greatest circumspection on the part of the engineer, and taxes his skill to produce uniformity of support at the least expense.* This is frequently done by expanding the base of the foundation where it is less firm, and that requires a knowledge of the supporting power of each different description of material, which must often be ascertained by direct experiment.

Rock is incompressible, and some earths, when dry, nearly so; sand and gravel is but slightly compressible when confined laterally, as in deep pits. Good soil will sustain from five to ten tons per square foot, but these weights will compress it a little. Earth, saturated with water, under heavy loads, will not only be compressed, but will also escape laterally whenever the frictional resistance which it meets with is less than that due to the pressure of the load, or it will, in shallow pits, cause an uplift of the adjacent material. This operation is familiarly exhibited, when an embankment of hard earth is placed upon a marsh where the substratum is in a semi-fluid state. The embankment at first sinks by the compression of the soil beneath, and as the weight is increased, the material below is forced out laterally, and forces up the superincumbent earth. I have noticed an elevation of several feet in height, extending a hundred feet or more beyond the banks, produced in this manner, even when the marsh was covered with trees of large size.

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* In a recent letter from John B. Jervis, to the author, he says: "I have read with satisfaction your views on 'Foundations,' the most difficult as well as the most important part of the science of engineering. To provide a support for a structure that shall be adequate, and with no great surplus, is a far more difficult problem than to make it sure at a much greater expense."

The weight of loaded bridges may be assumed as producing from four to eight tons per square foot of the area of piers, and of large buildings it is frequently twice as much, and hence the foundations are generally expanded to at least twice this area, when the structure rests upon moderately firm soil, not liable to displacement; but the degree of expansion of the base depends upon the foregoing conditions, and must sometimes be greatly increased beyond that named.

The present State Engineer carried a railroad bridge across the Montezuma marshes upon this principle of the expansion of the base, carried to an extent that I have never before met with. The load on each pier was about one hundred and thirty tons, and was distributed over eight hundred and seventy-four square feet of the marsh by a grillege of timber, giving about three hundred pounds per square foot. The work has been standing eighteen years without yielding.

In these expansions of the foundations, care must be taken that the slope or projections have sufficient vertical strength to safely carry the weight which will be brought upon them. A large proportion of the whole weight is thrown upon these projections, by the common method of making the front stone and joints closer than those of the interior. In bridge piers the walls are battered one-twelfth to one twenty-fourth with some of the bottom courses projecting in off-sets of six to twelve inches, depending upon the thickness and strength of the stone.

In cases where the foundations are always wet, and not subject to decay, timber forms a convenient and inexpensive method of extending the support a few feet beyond the exterior lines of the masonry, and where there is an ultimate decay anticipated, the timbers are placed apart, and the spaces made equal to the width of the timbers, and filled with concrete* masonry.

The concrete becomes hard enough to take the place of the timber before the latter decays. Some parts of a structure frequently bring greater weight upon that part of the foundation directly below it, than others, either because the walls are heavier or are loaded heavier, or by the form of the walls themselves, and care must be taken either to distribute this excess of weight over more of the surface, or to strengthen the foundation at such places.

The former is done by means of inverted arches, and still better, by direct and inverted arches.

When the circumstances of the case forbid the use of wood in the foundations, and it is desired to extend the base beyond the exterior lines of the masonry, or to equalize the pressure over the whole surface, a thick course of concrete masonry is spread over the bottom. As the cohesive strength of concrete, even when made in the best manner, is much less than that of timber, it must have a much greater depth to allow the same extent of expansion to the foundation.

Where hydraulic cement is expensive, the same object can be attained by the use of a heavy bed of small broken stone, and in some cases, gravel may be substituted with economy, and accomplish the desired end.

In these cases, and particularly with broken stone, the angular projections form a sort of mechanical arrangement, which distributes the weight brought upon each piece, to several of those beneath it, and by this means, the weight is distributed equally over the bottom, if the mass of stone is of sufficient thickness. The same result is obtained with concrete, with the additional advantage, that the angular projections of the stone are supported by the hydraulic mortar around it, which also binds the fragments together, and produces the result desired with less depth of material.†

A common practice is to form the first course of foundation masonry of large thin stone, which answers a good purpose, if these stone are strong enough to sustain the weight without breaking.

In the preceding remarks, it will be observed that the leading idea has been to obtain a foundation which will afford an equal support to all parts of the structure. This is almost as important as to obtain an unyielding support; indeed, a small degree of settlement occurs in all foundations, and even in the superstructure itself, when the walls are very high, or carry very heavy loads. The finest cut-stone facing yields slightly, and the coarser masonry of the interior, and that forming the foundation, considerably.

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* In Europe, the term concrete is applied to gravel mixed with quicklime mortar, and beton, to small broken stone, mixed with hydraulic cement mortar. American engineers rarely use the former, and apply the term concrete to the latter.

† There is a popular expression that "cement becomes as hard as stone." The best of it has about one-fourth the resistance against crushing, of sandstone, and one-sixth of that of granite.

When the natural material below the foundation is not firm enough to sustain the structure, or is liable to be scoured away, or to become softened irregularly, and it is not deemed advisable to sink it below these influences, resort is had to bearing piles.

Before commencing the discussion of this branch of the subject, it may be worth while to allude to an erroneous popular idea, that the support derived from piles is obtained by driving them until they reach a hard substratum. From what has been already stated in regard to the weight which earths will support, it will be seen that a pile, sharpened at the point, will not have more than one-fifth of a square foot of area resting upon such hard substratum, and as these piles are rarely driven nearer than three feet from center to center, the earth below must be firm enough to sustain nearly fifty times as much weight as we have assumed upon the ordinary foundations. No kinds of earth are able to sustain such pressures without yielding.

If the material between the foundation and the hard stratum below is very soft and allows the piles to yield laterally, they should be considered simply as columns of support, and if very long will be bent and broken, or will sway off laterally and allow the structure to fall. These consequences do not often follow, and hence we may assume that all except the softest materials does give considerable support to the piles from the cohesion of the sides, and as will be presently shown, gives in most cases nearly the whole sustaining power which is derived from them.

There are cases, however, where piles passing first through very soft material and driven some distance into a harder substratum derive support from the latter; but in this case, it is again emphatically repeated, that the support is mainly derived from the adhesion of the adjacent material to the exterior surface, and not from its its sectional area at the bottom.

Piles are sometimes used to compress a soil, which is not quite compact enough, in its natural condition, to sustain the structure, which they do to the extent of their own bulk, compared with the mass of the earth into which they are driven. Where the earth is liable to subsequent disturbance, piles so used are always valueless.

It is particularly necessary to caution the young engineer of the danger of using piles, either for compacting the earth or as mere columns of support.

Trustworthy foundations, as reliable as those on rock or hard earth, may be obtained by the means of piles, if they are properly driven, and in places where they are not liable to decay or lose their support by scour.

When each pile in the foundation is driven to the same point of resistance, they will each bear the same load. The force of the blow of the ram, the resistance which the pile meets, and the weight which it will bear, are of course all equal. So that if piles of different sizes are driven into different kinds of soil, until they cease to move, by the same ram falling the same distance, they will all bear the same load.

I recently read a paper before the Franklin Institute, in which I discussed this subject at considerable length, and from which I extract as follows:

"The formula which is generally used to determine the supporting power of wooden piles, is either that of Weisbach or Saunders. In the common range of practice, the results of these two formulæ do not widely differ, but the latter says that his result gives the "safe load," while the former says that "for duration and security such piles are only loaded with from one-tenth to one-hundredth of their strength."

The formula which I have to submit to your consideration is as follows:

$$P = 80. (W + .228\sqrt{F} - 1.)$$

Where P represents the extreme supporting power of the pile in tons; W, the weight of the ram in tons, and F the fall of the ram in feet.

This formula was derived from a number of experiments, made upon piles driven for the foundation and coffer-dams of the United States Dry Dock at Brooklyn.

The gentlemen present are doubtless all familiar with the characteristics of that work, and it will only be necessary to state that the structure weighed fifty thousand tons, which had to be supported on an area of forty-four thousand square feet; but the weight could not be equally distributed, and some portions of the foundation had to sustain a weight of three or four tons per square foot.

The material as developed by the excavation, preliminary borings, and subsequent examinations to a depth of sixty feet below the foundation, was a silicious sand mixed with comminuted particles of mica and a little vegetable loam, and was generally encountered in the form of quicksand.

The material into which the foundation piles were driven was nearly uniform in character, which furnished an excellent opportunity of comparing the experiments made at different times, with hammers of different weights and falls.

It may be interesting to state, that the whole number of bearing piles driven for the foundation was 6,539 and 1,744 sheeting piles, acting in part as supporting piles, which gives nearly 1.7 piles per square yard, or, excluding the sheet piles, 1.4 per square yard.

These piles were chiefly of spruce timber, from twenty-five to forty feet long, and averaged thirty-two feet driven length. They were from twelve to eighteen inches diameter at the head, and never less than seven inches at the foot. They were banded with iron, and occasionally shod, but shoeing produced no increase of penetration.

The average number of blows given to each pile was seventy-three. The average distance moved by the first five blows was eight inches at each blow, by the middle five blows, three inches at each blow, and by the last five blows from two inches to no movement at each blow.

When from any cause the piles went more than an inch at each of the last five blows, another was driven in the center of the quadrangle, and it was found that this so compacted the material, that the adjacent piles were immovable under the effect of almost any number of blows, of a ton ram, falling thirty feet.

In other words, all of the piles were driven "home," or equivalent to such home driving. The Nasmyth hammer, it is true, produced a deeper penetration of perhaps ten per cent, but under its persuasive powers, the strongest and toughest timbers yielded.

A record was kept of the distance moved by each blow, on every pile used in the structure, and the weight and fall of the hammer.

The piling machines were unusually well made, so as to reduce the friction of the hammer in its fall, and facilitate the operations. The leaders were generally thirty-five feet long, though there was one of fifty-seven feet. The hammers were generally of a ton weight

(2,240 pounds), but there were some used ranging from a thousand to forty-five hundred pounds.

The experimental piles were selected so as to show the effect of the size of the pile, the weight and fall of the ram, and the rapidity of the blows, as determined by the record before alluded to.

The analysis of these experiments showed the following general laws:

1. That when the height of the fall of the ram was increased, the sustaining power of the pile (driven home) was increased in the ratio of the square root of the fall.

2. That when the weight of the ram was increased, its effect was to increase the sustaining power of the pile by 0.7 to 0.9 times the amount of the ratio due to such increased weight.

3. That when piles of the same size were driven by the same hammer and from the same height of fall to different depths, their sustaining power was in the ratio of the squares of their frictional surfaces of penetration.

4. That a pile driven home by a hammer of a ton weight, falling thirty feet at the last blows, in such material, would sustain as many tons as there were superficial feet of exterior surface of the pile in contact with the earth, which, however, may be considered as excluding the support due to its sectional area.

The formula above stated is based upon these laws (excluding the third), and the co-efficient is reliable for such material as was found at that place.

It is very desirable that similar experiments should be made in soils of different kinds, which would make this formula applicable to all the usual cases met with in constructions.

I have made experiments elsewhere, but unfortunately they were in soil too nearly similar to the above, to enable me to give any new co-efficients. They served to show the general accuracy of the formula given.

I may here remark that the circumstances of each particular case must determine how much of the absolute sustaining power should be deducted to show the load which can be safely imposed upon the piles.

When there is no danger from the vibrations of the structure being communicated to the piles, nor from the scouring action of the water, they may be safely loaded with one-third of the weight determined by the formula.

The sustaining power of a pile driven home, the resistance which it meets with, and the force of the blow are, of course, equal. The subsequent subsidence of the material around the pile, however, increases its supporting power, and this varies in different kinds of soil.

This increased support cannot, however, be relied upon, if there is any subsequent vibration in the piles or scour around them.

In foundations under water, there will be a degree of fluidity given to the material by the operation of driving, which lessens the frictional resistance to the penetration of the pile; but the superior gravity of the sand to that of the water, allows it to settle in close contact with the pile, and gives a greater co-efficient of support than if it was driven through the same kind of material in a dry state.

In comparatively slender elastic wooden piles, the vibrations caused by the blows enlarge the passage and loosen the material in contact with the sides, and although these vibrations absorb a portion of the force of the blow, they probably increase the penetration.

In concluding this branch of the subject, it may be added that, with a given power, a considerable advantage is gained by increasing the weight of the ram, and, with a corresponding force of blow, less injury is done to the timber and to the iron rings.

Also, that there is no increased force of blow obtained by a fall of more than forty feet, as the friction on the ways is increased so rapidly that no increased velocity is attained by falling from a greater height. In machines less well made than those at Brooklyn, the limit of useful fall is probably thirty feet or less.

On comparing the results of the Nasmyth machine with those of the ordinary ones, it was observed, that although the force of its blows was much less, the effect was much greater.

With the former, a pile of thirty-five feet length was driven home in seven minutes, while with the other machines, an hour or more was required to drive a similar pile.

The first part of the operation did not exhibit so marked a difference between the two machines as was afterwards shown, while the piles were meeting with greater resistances.

In the first case, the force of the blow in each machine was in part absorbed by the vibrations of that part of the pile above ground; while in the latter, these vibrations, for the instant, removed the partially fluid earth from contact with the pile. The blows of the Nasmyth ram were given at intervals of less than a second of time, and before the material displaced by the vibrations of the preceding blow had had time to subside, and therefore nearly the whole force of its blow was employed in the displacement beneath the pile. In the other machines, the blows were given at intervals of a minute, by which time the vibrations had ceased, and the material had partially subsided around the pile, so that a considerable portion of the force of the blow was consumed in overcoming the friction along the sides, and in the removal by new vibrations, leaving only a comparatively small portion of the force to displace the earth at the bottom.

This effect would probably be produced in nearly all descriptions of earth, although it would be greater in loose and partially fluid material than in clay or compact soil.

The use of the Nasmyth machine demonstrates the value of quick blows, not only in the economy of driving, but also in obtaining a deeper penetration, which is often very desirable.

The comparative cost of driving by the use of different kinds of power, is nearly as follows:

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| By steam with the Nasmyth ram | 5. |
| " " ordinary machines | 9. |
| " horse-power with " " | 12. |
| " man-power—tread-wheel | 15. |
| " " cranks | 20. |

And these sums represent cents per lineal foot of pile driven in 1846."

With a reliable rule like that above furnished, the piles may be driven for a foundation, so that it shall be able to sustain in every place, the load of the superstructure, even when very unequally distributed.

I have frequently observed foundations made when the piles were driven without regard to these essential conditions—where, if the support of the piles had been tested, some of them would be found to have but one-tenth of the sustaining power of other contiguous ones; so that in one place, a large expense has been wasted, and in another the support was insufficient, and the structure was in danger of being ruined, or it is only saved from immediate destruction by the strength of the grillage or of its inherent tenacity, and is liable to fail at any moment.

In rivers subject to rapid currents, the obstructions caused by the piers greatly increase the velocity of the water over the river bed, adjacent to the piles, and frequently removes the material from around them. The great loss of support by this action, may be understood by one of the rules before given, applied to a case where a scour equal to one-third of the depth of the pile, destroys not one-third, but two-thirds of its supporting power.*

Wooden piles, alternately wet and dry, will decay rapidly, and in seawater, are liable to the attack of the Teredo. In these cases they should not be used.

There are also cases where, from the great weight which it is necessary to impose, or where the soil is so loose as not to afford the lateral support, with timbers of such length as are accessible, or in very deep water, where the great length of the pile above the earth will absorb a large part of the force of the ram, by its vibrations, and prevent its penetration to a requisite depth, iron piles should be substituted for wooden ones.

Before entering upon the discussion of iron piles, it may be well to further consider the question of placing foundations below the surface of the water, by other methods.

Such foundations are sometimes brought up to the surface of the water, by means of loose rock, thrown upon the bed of the river, forming an artificial island; sometimes by cribs of timber, and sometimes of such cribs filled with stone or concrete. The first of these methods is rarely admissible, from the great obstruction which it produces in the channel, and the other two plans, depending upon the durability of the timber, are seldom used for important structures.

When it becomes necessary to place the foundation at a considerable depth below the surface of the water, resort is had to a coffer-dam, caisson, or to the diving bell.

Coffer-dams are used when it is required to drive the foundation piles to great depths, or where the case demands, that the work required to be built beneath the surface of the water, shall be dry and exposed.

Coffer-dams, in deep water, are so expensive that caissons of wood or iron are now generally substituted.

The French engineers have used a caisson without a bottom, and filled in with a deep bed of concrete, both outside and inside of the caisson, which then becomes a coffer-dam, and allows the water to be pumped out and the work constructed within the space.

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* Piles are usually driven with the small end down, so that the area of the upper one-third is greater in proportion to the length than the average of the whole pile. If the pile was of the same diameter throughout, the loss would be five-ninths.

The ordinary caisson has a strong bottom, which is arranged to form the foundation for the masonry, and generally the sides are arranged to be removed after the pier has been completed to the level of the water. The sub-foundation is either the natural bed of the river, dredged to an uniform level plane, or formed by long bearing piles, driven from above the water, and cut off to a level plane at the natural or a dredged bed of the river.

The caisson is made either of wood or of iron, and is directed in its descent upon the sub-foundation by guide piles. Sometimes the caisson is loaded and sunk directly to its place, and the masonry built up within it, but more frequently it is allowed to float, and descends as fast as it is loaded with the masonry which is built within it. In some cases the descent of the caisson is regulated by large screws, by means of which it is only buoyed up by its floatation in part, and enough of the weight is retained upon the screws, to avoid the effect of changes in the level of the water.

Another method is precisely similar to that just described, except that there is no caisson, and only the strong platform, which is arranged to serve for the permanent foundation, upon which the masonry is built, being retained above the water by screws, and gradually lowered as the masonry is built up.

When a diving-bell is used, the foundation is prepared as before stated, and the stone are laid as in work above ground. As no cement can be used in this case, the stone are cut to fit each other closely, and are dowelled and bolted together.

The use of iron piles will in most cases allow the work to be constructed without the aid of these submarine contrivances, because they may be driven to almost any depth, and of a diameter sufficient to give the requisite lateral strength, and may, therefore, be brought up to the surface of the water. Wooden piles, on the contrary, can be no larger than the trees that produce them.

A popular objection to the use of cast-iron piles has arisen from an apprehension that the metal will rapidly corrode when immersed in water, or exposed to the alternations of moisture and dry atmosphere.

I have recently written a paper on this subject, which I have been requested to read in this connection, as follows:

## CORROSION OF IRON.

The question of the durability of iron, especially when exposed to the alternations of moisture and the atmosphere, has been frequently discussed, and until lately, it was generally assumed, that a rapid corrosion was inseparable from the use of this metal thus exposed, and when wholly immersed in water.

Numerous cases were cited to prove these positions, and the every-day experience of constructors seemed to confirm it. Wrought-iron bolts in wooden mill dams, and similar places, were found to rapidly oxydize, and those in sunken vessels, to have become nearly eaten up in a few years.

Cast-iron cannon and shot, immersed in seawater, from a quarter to one-half a century, were often found, with the structure of the mass of the metal entirely changed from iron into plumbago or graphite, and in other cases deeply pitted by oxydation.

During the earlier discussions of the subject, the inquirer was frequently staggered in his belief of the generally received opinion, by finding both wrought and cast-iron, which had been immersed many years, and was but slightly oxydated, and with no change in the structure of the metal, and that sometimes, as in the case of the cannon of the Royal George, which had been submerged for half a century, the metal which had become so soft as to be cut with a knife, hardened rapidly when removed from the water, so much so, as to be able to bear again the same charge in firing.

Some muskets and cannon sunk in Lakes Erie and Ontario during the war of 1812, were taken up forty years afterwards, almost uninjured, and only slightly oxydated. An iron steamer, the "Aaron Manly," is cited by Grantham, as having been built in 1822, and kept in constant use, alternately in fresh and salt water for twenty years, and when examined, no signs of corrosion were visible, and the vessel was in use ten years later, having received but small repairs during the whole period. William Fairbairn also cites cases of iron vessels which had been from six to ten years in saltwater, and showed no corrosion.

In 1850, when this subject was much discussed in England. the unexpected absence of corrosion of wrought-iron in ships navigating the ocean, was attributed to the constant vibration of the metal, as the same result is noticed in railway bars. It was also remarked that frequently no corrosion took place on the interior surfaces, or the other fixed iron parts of these ships.

In 1822, Dr. McCullock produced plumbago from cast-iron immersed in acidulated water, and forty years later, Dr. Calvert produced the same result in sea and foul waters. Mr. Mallet, at the request of the Royal Society, made the well-known experiments on the corrosion of many kinds of iron exposed to the common and foul atmospheres, to clear, foul, acidulated and salt waters, and came to the following general conclusions:

That iron exposed to water holding air in combination, corrodes on the surface, either uniformly, or in places, by rust, or by conversion into plumbago, and that the corrosion depends upon the want of homogeneousness of the surface, or in its denseness, hardness, or the combination of the carbon with the metallic iron.

This subject was under discussion at the London Institution of Civil Engineers in 1862, and some of the most eminent engineers there, joined in the discussion. It is probably the most complete examination of the question that had up to that time been made, and the numerous cases which were cited, both of the corrosion and of its absence, in iron under water, and the causes, seem to leave but little more to be said on the subject.

Three of the iron gates at Sheerness, have resisted the action of salt water for forty years uninjured, and in the fourth one, the lower segment has become softened in less time, caused by contact with a lead facing, producing a galvanic action. Similar gates at Pembroke, of more than half the same age, are in perfect preservation.

Mr. Cabitt drove cast-iron piles at Lowestoft in 1834, which were, in 1862, as sound and perfect as when driven.

Mr. Simpson had previously carefully examined the question, and by selecting the iron for the piles of the southern pier, driven in 1844, found them eighteen years after in a perfect state. "The square angles were as sharp as when they left the foundery." He stated that the durability of cast-iron in salt water, depended entirely upon its quality. In the Heine bay pier. built by Telford, on wooden piles, and renewed in 1838, with cast-iron piles, the latter were now perfectly uninjured. "The angles were as sharp as when they left the foundery; not a shilling has been expended for repairs upon them." "Some of the cast-iron piles, used for the Margate jetty in 1831, were taken up twenty-two years afterwards, and were sold at the same price as pig iron. On careful examination, they were as sound as when they left the foundery, and in no instance can any softening be detected, while some of the original piles still in place, after standing thirty-one years in the sea, show no evidence of the slightest deterioration."

Other numerous cases can be cited of the duration of cast-iron in seawater, which show no effects after an immersion of a quarter of a century or more. Those which do show injury or decomposition within a less period, are where iron of an unsuitable quality has been used. "The engineer has therefore only to select a proper quality of metal to insure its durability. With gray iron, having a good surface, no apprehensions of its decay in salt water need be apprehended, and he (Mr. Simpson) was about to use it extensively for piles in submarine works."

Mr. Webb said that from his examination of the question, and of works executed, that strong iron, of proper quality, exposed to the action of salt water, would last an indefinite time.

The discussion of this subject at the London Institution, and the cases named, are therefore conclusive on the question, and demonstrate that where corrosion or change of structure does take place, it is due either to the use of an improper quality of iron or in placing it in contact with other metals, so as to produce a galvanic action.

Cast-iron, to resist corrosion, should be as hard as the case will admit, of an even, close grain, and with the carbon combined and not in the form of graphite. Impure, soft foundery iron, will corrode rapidly; close-grained gray iron, of an even texture, will endure in the most exposed places, more than a quarter of a century without sensible injury; and white iron of good quality may, for all practical purposes, be considered as imperishable in such situations.

It is well known to the profession in this country, that many cast-iron water mains have corroded greatly, not only externally, when they are exposed to the alternations of moist and dry earth and to the mephitic gases from sewers and leaky gas-pipes, but also internally, when they are only exposed to the action of the most pure water, and a small amount of air in combination. In the latter case, the oxydation sometimes takes the tubucular form, where the rust is collected and aggregated in hard knobs.

In the early practice in this country, water-pipes were often made from the worst quality of metal—it could hardly be called iron—but was a composition of iron cinders, burnt sand, and scoria. The iron of this compound was the softest, most open-grained and in large crystals; indeed precisely such a mixture as would offer the least resistance to corrosion or disintegration.

It is not at all surprising that such iron should corrode rapidly and fearfully, and these cases are often improperly referred to, to confirm the assertion that cast-iron rapidly corrodes.

The practice of our modern engineers has corrected some of the causes of the defects in the manufacture of water-pipe, but it is well known that the metal often put in them is the cheapest in the market, and the specifications and inspection of pipes for many of our water works, show that the engineers who prepare them, either do not understand the quality of the metal best calculated to withstand corrosion, or are restrained from requiring it on account of its higher cost.

In the removal of the old water-pipes at Albany, in 1851, which had been buried for a quarter of a century, I found some which were excessively corroded, and others so little affected that they were relaid in the new works. The present engineer, Mr. Carpenter, informed me lately, that he had examined some of those which I had laid down sixteen years ago, and found them perfectly sound and uncorroded; in some cases the paint marks were still bright and legible. I have seen some of the old Manhattan water-pipes taken up in New York, which had been in the earth over forty years, and for twenty-five years without water in them, which were, as the English engineer said, "as sound and uncorroded as the day they left the foundery." Other of these pipes, however, were greatly corroded, and I have seen such badly corroded pipes kept to show that iron was not a suitable material for water-pipes.

With the experience now acquired, iron piles may be used, made of a proper description of metal, with the assurance that they will last centuries without being sensibly injured by corrosion.

These piles are usually made cylindrical and of varying sizes, from a few inches diameter up to twenty feet. They cannot be driven to a great depth or through hard material by the machines used for driving wooden piles.

The pneumatic and hydraulic processes are therefore used, as well as that by excavating from within by machine or hand labor. Dr. Potts procured a patent in England for the former process, about twenty years ago. In his method, the bottom of the pile was open and the top sealed.

By exhausting the air from the interior of the hollow pile, a downward atmospheric pressure was effected, sufficient to drive the pile into moderately soft material.

In 1850, a bridge was commenced across the Medway, at Rochester, England, the piers of which were of hollow cast-iron piles, of seven feet diameter, and driven forty-four feet into the bed of the river, through sand, gravel, rocks and timber, the latter being the debris of the old bridge; perhaps some of the works left by the Romans.

Dr. Potts' process was at first used, but it was soon found to be insufficient, and the reverse process, the plenum, was then tried, by means of which these columns were driven through the obstacles already mentioned, in an extraordinarily short time, and at less than one-third of the cost which had been anticipated, by the ordinary method of constructing such works, and to the astonishment of the engineers of the day.

Some years previous, however, Mr. Triger had applied this principle, at Languire, in sinking cast-iron columns of three feet diameter, for a coal shaft, through quicksands, and to a depth of eighty-two feet.

Soon after the commencement of the Rochester bridge, the same engineer, Sir William Cubitt, built the piers of the Peterboro bridge, with cast-iron caissons six feet square, placed in contact and filled with brick masonry.

A year or two later, Major Gwynne and L. J. Fleming commenced the construction of a bridge across the Pedee, in North Carolina, with piers and foundations, composed of columns six feet in diameter, driven about twenty-five feet through sand.

They, also, commenced by using Dr. Potts' vacuum process, but encountering, with their first column, a large cypress log, were compelled to resort to the plenum process, to effect its removal, and thereafter that method was used exclusively.

Shortly after, these engineers constructed the Santee bridge, and in 1859, Gen. Smith commenced the Savannah bridge, and the piers of both were built upon the same plan.

In May, 1860, I commenced the construction of the Harlem bridge, the pivot pier of which was arranged to be composed of ten cast-iron columns of six feet diameter, driven to a depth of nearly fifty feet below the water; and subsequently, I arranged a plan of an inverted caisson, in compartments, covering the whole size of the proposed stone piers, the masonry of which I intended to lay by means of the pneumatic process.

From the year 1850 to this time (1860), and subsequently, a great many bridges were built in Europe and elsewhere, upon this general plan, and various modifications of it; and the better the plan became known, the more favor it met with, until, at last, it has become nearly the universal method, where the currents are rapid and river beds treacherous.

Among the eminent engineers who have used this plan, may be mentioned Cubitt, Hawkshaw and Simpson, past-presidents of the Institution of Civil Engineers of London, and Brunel, Hemans, Brunlees, Page and Fox, Rawlinson, Brereton, Fitzgibbon, Brassy and many more of the prominent engineers of England, besides a great many of the continental engineers.

The common method of using the pneumatic process is as follows: The pile consists of a number of hollow cast-iron cylinders,* *A A*, about nine feet in length, provided with flanges on the inside, by which they are bolted together, one on the top of the other, until the desired length is obtained. From a platform on temporary wooden piles, or large scow boats, a derrick is placed which suspends the column and lands it, with the end on the bottom of the river in the place where it is to be driven. Another cylinder, *B*, called the air-lock, is placed on top of the column, usually made of boiler iron, with a top and bottom plate of cast-iron, in which are man-holes, *C C*, that can be closed at pleasure by plates, *D D*, with hinges opening on the lower sides and lined with rubber at the joints. In the top and in the diaphragm or lower plate are air-cocks, *E E*. Leading from the outside of the air-lock, near the bottom, are two curved tubes, *F*, which also pass through the diaphragm and are closed by cocks. The air-lock is bolted to the top of the column. Small air-pumps usually worked by a small steam engine are connected with one of the curved pipes in the air-lock by means of a flexible tube. The lower man-hole plate is then closed, and air is forced into the column.

With the first stroke of the pumps, the operation of compressing the air commences, and as this pressure increases it forces the water out through the open bottom. This continues until the pressure of air equals that due to the head of water outside the column, and the water has all been forced outside. The workmen then enter the air-lock, and closing the upper man-hole a cock is opened in the lower diaphragm, and the compressed air from below is admitted. When the pressure has become equalized the lower man-hole plate falls open and the workmen can pass down on ladders to the bed of the river to excavate the material in the column. This is raised in canvas bags to the air-lock by means of a drum, the shaft of which passes through stuffing-boxes to the

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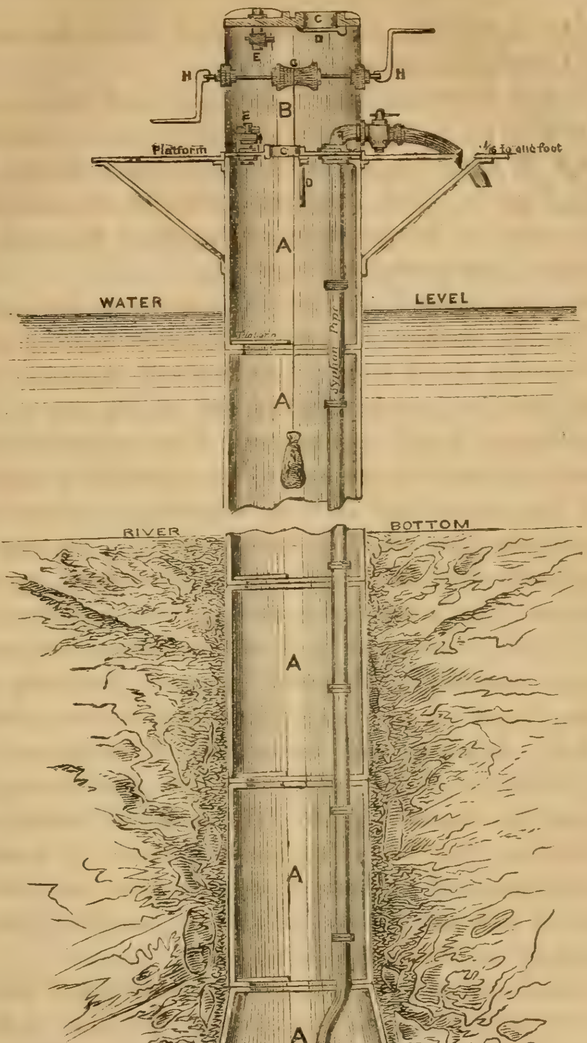
* See Diagram.



DIAGRAM

*To illustrate the pneumatic method of driving Iron Piles or Columns, practiced at Harlem, by Wm. J. McAlpine.*

outside, where it is worked by hand on signal. When the column has been entirely cleared down to the bottom, the workmen ascend into the air-lock, and, closing the lower valve, the compressed air in the air-lock is allowed to escape, the upper valve falls open, the men pass out, and the bags of material are removed. Men are then stationed at the guy ropes, and the cock in the second curved pipe is opened, and the compressed air in the column allowed to escape quickly. The pressure of the air in the column on the upper surface neutralizes its weight to an extent which is governed by the depth of the bottom of the column. By allowing the air to escape quickly in the manner mentioned, this weight is suddenly restored with an effect similar to a blow, while at the same time the rapid inrush of water at the bottom, causes a complete scouring of the material at and under the sharp rim of the column, so that the resistance to driving it is simultaneously removed.

The friction of the outside of the column against the material through which it penetrates, is greatly diminished by the current of water passing along its surface from the river on its way downward to the inside. If no rocks, logs or similar obstructions are encountered, the column will continue to settle quite rapidly during the time the air is escaping, and afterwards until the material has stopped scouring under the edges, and has compacted itself under the pressure of the water sufficiently hard to sustain its weight. The amount of settling in one operation will frequently amount to ten or twelve feet, or even more.

When boulders or logs are met with, the column stops, and it is then recharged with air. The workmen descend and remove the obstruction, and the process already described is repeated. In this manner, columns of almost any dimension may be sunk to any required depth, even to one hundred feet or more.

In the construction of Harlem bridge, my brother and myself were in the habit of entering the columns daily, and frequently, in conducting some of the more important and delicate operations required, have spent hours under air pressure. The greatest depth at which we have been under water was over fifty feet. The pressure due to this depth was about twenty-two pounds to the square inch over the atmospheric pressure, or, with the latter added, thirty-seven pounds; but this again was frequently increased by the extra pressure required to drive out the water through the compacted material around the outside of the column, so that the pressure was often increased by as much as an additional atmosphere, or about fifty-two pounds per square inch in all, equal to a depth of eighty-five feet below the water. After entering the air-lock, it was closed against the atmosphere, and the pressure equalized with that in the column, in the manner that has been already described; and this operation, and the other one of equalizing with the atmosphere when passing out of the column, were the only times when difficulty from the air pressure was experienced. Men of certain kinds of constitution sometimes suffered greatly, the blood starting from the nose, ears and mouth, and the pain of changing pressure being almost insupportable upon the eyeballs and drum of the ear. These were usually of a very nervous temperament, and excitement would induce them to keep their nerves under great strain, which added to their difficulties. No trouble was experienced in procuring men, however, who could bear the pressure perfectly well without injury. A little practice and familiarity soon accustomed them to the circumstances. The muscular action of swallowing would always relieve the ear drum temporarily from pain and pressure, but after a little practice this was found to be seldom necessary. With new men, the pressure would be let on gradually; but those more accustomed to it, did not hesitate to equalize as fast as their means of doing so allowed, or in a space of less than a minute.

The pressure once fully on, it would be difficult, from any bodily sensations, to determine a difference of pressure amounting to at least one atmosphere. The effect, while under air pressure, is to cause a feeling of exhilaration, so sensibly felt by the workmen, that a lazy man becomes industrious, and there is seldom occasion to urge any of them in their work. The ventilation is of course excellent, and the operation of breathing becomes so easy that the inhalations are slower and longer than in the usual atmosphere.

Upon leaving the column and again entering the ordinary atmosphere, the absence of the stimulus of so much oxygen produces a certain degree of lassitude for a time, unaccompanied, however, with any other difficulty. It could not be observed, either in our case, or that of the workmen, that in an experience extending over a period of nearly a year, any effect prejudicial to the health or constitution was produced.

It may be here stated that the men worked the same number of hours inside the columns as those outside, and that they were paid but a slight advance over the wages of ordinary workmen.

Where no obstructions are met with, and the excavation is moderately easy, these columns can be driven from ten to twenty feet per day. When boulders, logs, etc., are encountered, they can be cut through by the workmen, from the inside of the column, with much less delay than would be expected by those not familiar with the operation.

One of the columns at Harlem was driven twenty-seven feet, through a constant succession of hard boulders, in as many days; and another eight feet, through a sunken vessel, with a delay of only two days.

When a stratum of clay or other tight material was met with, which prevented the water from passing out at the bottom, a syphon pipe was used, leading up through the column and out at the top, through which it was discharged.

These columns can be driven at any season, in the winter months as well as in the summer. The compression of the air raises its temperature ten or fifteen degrees, but when the workmen complained of cold, this was increased to any desired extent by the use of a heater through which the exhaust steam was passed, which heated the air that was forced into the column, to any desired extent.

In the intensely hot weather of summer, a simple process of evaporation from water spray will cool the atmosphere within the column, ten or fifteen degrees.

In conducting some other works of which I have descriptions, the labor had to be suspended, from these expedients not having been used.

One of the most important modern improvements in this system of foundations, is what I have termed "the expansion of the base," by means of which the supporting power of the pile or column is vastly increased at a trifling cost.

This was first developed at Harlem, when we trebled the base support, at a cost of less than a hundred dollars, by extending the concrete filling to a distance of three feet beyond the exterior of the columns, and to a depth of four feet below them, and this may be generally carried to a still greater extent.

The value of this improvement will be appreciated, when it is stated that the supporting power of the Harlem columns, from their exterior frictional surface, was about two hundred tons, and from their base support, unexpanded, a little less than three hundred tons, while the expansion of the base added eight hundred tons, or nearly twice as much as from both the other sources of support.

As I have very fully described the method of accomplishing this result, in a paper which has been sent to London for publication, and in another, which will soon be published in this country, I refrain from again describing it, but will furnish it to any person interested. In some previous discussions, questions were raised whether iron piles or columns would withstand the pressure of the intense frosts of our climate, and the shocks from vessels, rafts or ice.

When these columns are carried above water, filled with concrete and capped on top, they are effectually sealed against the admission of water; but if by any circumstance, it should obtain admission, its expansion in freezing would be first exerted in compressing the concrete filling, which has but one-tenth of the power of resistance possessed by the iron shell. In Scotland and Northern Russia, as well as at Harlem, no injury has ever resulted from this cause.

In regard to the second objection, there is but one case on record, where any injury has been caused by a very severe blow, and it has since been ascertained that it arose in consequence of one of the castings being defective.

The repeated experience at the Chepston bridge over the Severn, the Charring Cross and several others in Europe, besides those over the Pedee, Santee, Savannah and Harlem rivers, show conclusively, that they are well adapted to resist the most severe shocks that will ever be brought against them, and that they are as well adapted for this purpose as the firmest stone piers.

When it becomes necessary to use the pneumatic process to remove obstructions from beneath, the columns must be not less than twenty-four, and perhaps thirty inches, exterior diameter.

In this case a conical working chamber of six feet in diameter, would be found very convenient, and a column of that form can be driven with equal, or perhaps greater facility, than a cylindrical one.

The hydrostatic process has been repeatedly used, under certain circumstances, with greater economy than the pneumatic; either by forcing the water into them, from a natural head, or by a force pump, and driving the water and with it the interior soft material to the outside, or through the syphon-pipe before described.

When the column is passing through a close material like clay, its descent may be very much facilitated by using at different places along its sides, controllable water-jets, which will allow the water from the inside to pass outward at many points under pressure, and so soften and lubricate the material as to lessen the resistance and destroy a portion of the friction.

When the material to be penetrated is sufficiently close to prevent the entrance of the water at the bottom, the top may be left open, and the water removed in the ordinary way of pumping, and the excavation performed, either by hand or by machinery.

For the latter, the ordinary mill-bucket elevator is probably the best machinery that can be used.

A patent has been taken out by Gen. W. S. Smith, for removing soft excavation, by means of a syphon steam-jet.

With the hydrostatic process, piles as small as seven inches outside diameter, have been driven into firm sand at a cost of nine cents, gold, per foot for the driving.

In regard to size and form, this system has been extended to cover the shape and size of the entire pier, embracing forms which were cylindrical, elliptical, triangular and rectangular. In these cases, the shell was usually of wrought-iron and removable, and the support obtained by filling them with masonry.

When of large size, and the pneumatic process used, they are usually called inverted caissons.

A pier was built by Brunel, at Saltath, by this method, with a caisson thirty-seven feet in diameter, and to a depth of ninety-eight below the water; the lower fifteen feet being an inverted caisson, where the pneumatic process was used and connected with the upper portion, which was direct and removable.

It may be interesting to add here, that the pier was carried up one hundred feet still higher, by means of iron columns.

In many cases the entire pier and its foundations may be made of these columns, which can be constructed of ample strength to support the heaviest loads, and to resist the most severe impacts to which they will be subjected.

In exceedingly difficult places, iron piles or piers can be built much cheaper than stone piers on wooden piles. In many places, with no more expense, and in others, they offer to the engineer the only foundation that he can rely upon.

American engineers have generally looked upon this system of foundations unfavorably, from the unnecessarily expensive examples in this country, and the costly methods which prevail in other countries, but chiefly from not understanding the modifications which may be made in the system to meet the different cases. These offer to the appreciative engineer, oftentimes, the only means of safely founding his works, and at a reasonable cost, and warrants more attention than it has heretofore received in this country.

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## February 20, 1868.

Prof. S. D. Tillman in the chair.

The meeting was opened by the Chairman, who read the following notes on science and art.

### THE COHOES MASTODON.

This skeleton has been mounted in the State Geological Hall, at Albany, by Professor Hall and his assistants. Its height is nine and a half feet. The length of the spinal column is fifteen feet; of the whole skeleton, following the curve, twenty and a half feet, and in a straight line fourteen and a quarter feet.

### CONDY'S FLUID.

The great sanitary value of this preparation, as proved by the late experience of Prussian army surgeons, has been recognized by the "International Societies for aid to the wounded in time of war," who have awarded to Mr. Condy their medal for the discovery of the disinfecting properties of the alkaline permanganates.

### TURKEY-RED.

M. Bernard has shortened the time of dyeing calico and woolen clothes with madder, by previously oxydizing the oil used in the first part of the process. This is effected by heating the oil to 95° C, with a solution of the chlorate of potash, and adding very gradually oxalic acid. The mixture is afterward boiled for some hours.

### TIERS-ARGENT.

This beautiful white alloy, first made by Taloureau, consists of two-thirds of aluminum and one-third silver. It is now made perfectly homogeneous and is easily fabricated. Its hardness and lightness are valuable qualities in table furniture. Spoons, forks, goblets, and salvers made of this material are rapidly coming into use in Paris.

### EFFERVESCING CITRATE OF MAGNESIA.

A correspondent of *The Chemical News* asserts that the compound sold in England, under the name of "granular effervescing citrate of magnesia," contains neither magnesia nor citric acid; another correspondent states that it is nothing more than citro-tartrate of soda, with the addition of sugar and four or five per-cent of sulphate of magnesia.

### OOLOGY.

Dr. Blasius has given, in *Kölliker's Zeitschrift*, part third, an account of his microscopic examination of birds' eggs, to ascertain whether they present sufficient distinguishing characteristics to separate the larger groups of birds; he reports that the minute differences revealed by the microscope are neither constant nor trustworthy, and are, therefore, of no importance in systematic ornithology.

### STRUCTURE OF THE LIVER.

Prof. Herring, from a study of the minute structure of the liver of a rabbit, as well as many other mammals, concludes that the bile passes to the periphery of the lobule in channels which lie between, and have their walls formed by the liver cells, and which communicate with the interlobular branches of the hepatic duct. The new view is accepted by Eberth and other prominent histologists.

### HEAT OF FUSION.

The melting point of metals and fusible silicates is lower than usually stated. Wedgewood's pyrometer and other similar measuring instruments have been found to be quite unreliable for high temperatures. Herr C. Sching, has shown by the application of the thermo-electric pyrometer, that the temperature of a glass furnace in operation is only from 1.100° to 1.250° Centigrade. Crystal glass becomes completely liquid at 929° C., and is worked at 833°. A Bohemian glass tube softens at 769° and becomes liquid at 1,052° C. Pure limestone loses its carbonic acid by heating for several hours at 617° to 675°, C. The gas can be driven off more rapidly by increasing the temperature.

### RIVER IMPROVEMENT.

An officer of the United States Coast Survey, has lately surveyed the head waters of the Minnesota river, with a view of turning into it the outlets of many lakes, which now discharge into the Bois de Sioux, which flows north, and is the principal branch of the Red river of the north. This report has not been published, but is believed to be favorable. Lake Traverse lies south of the dividing ridge, yet, flows through it into the Bois de Sioux. The distance from the head of Lake Traverse to the head of Big Stone Lake, which empties into Whetstone river, a branch of the Minnesota, is less than ten miles. A short canal would unite these lakes. Ottertail lake, and many other lakes, including Elbow lake which lies about forty-seven degrees north latitude, discharge their surplus waters into the main branch of the Red river of the north. But little definite knowledge of the topography of the country can be obtained from our present maps. The whole surface is nearly level. It does not seem impossible to dam the Red river at or near Breckinridge, and cause all the waters of its main branches to be discharged into Big Stone lake, thus forming a water communication between Elbow lake and the Mississippi river.

### HYDRATE OF BI-SULPHIDE OF CARBON.

M. Duclaux, a French chemist, has lately produced a new compound, which consists of two atoms of bi-sulphide of carbon and one atom of water (*allt-eros*).

### A GREAT REFRACTOR.

Mr. Cooke, of London, has just completed a twenty-five inch object glass, the largest yet made. The telescope has been subjected to the usual tests in resolving celestial objects, and is pronounced optically excellent.

### CONCENTRATION OF THE SUN'S HEAT.

The lens recently made for Mr Parker, of London, is three feet in diameter, three inches thick in the center, and weighs 212 pounds. In its focus small quantities of the most refractory metals are quickly fused and completely dissipated into vapor, and the usually unyielding minerals are immediately vitrified.

### THE DISTINCT ACTION OF ACTINIC AND LUMINOUS RAYS.

The photographs taken in England during the lunar eclipse on Sept. 13, do not represent a certain portion of the moon seen with the telescope. Mr. De la Rue has well expressed the nature of this peculiarity, by saying that more of the moon is eclipsed chemically than optically.

### NEW SENSITIVE COMPOUND.

M. Prat, who claims to have isolated fluoride, forms a fluorine of silver insoluble in water, and soluble in ammonia from which it is precipitated by nitric acid. It is altered by light more rapidily than chloride of silver. The ordinary soluble fluoride of silver known to chemists is, according to Prat, an oxy-fluoride.

### CARBONIZED PAPER.

Mr. J. E. Hover, of Philadelphia, has invented a new kind of writing and printing paper. The improvement consists in charging the paper with an earthy carbonate. Common writing ink, of the palest description, when applied to it becomes intensely black. The mineral surface given to the paper prevents "greasiness," and allows the ink to flow freely. It also takes printing ink more readily and produces a black and smooth impression.

### FUNGI IN THE HAIR.

Mr. John Bishop described, at a meeting of the Edinburgh Botanical Society, a case of fungoid disease of the beard, in which the hair broke off short, curled up and appeared as though singed. The microscope showed a cellular fungus growth within the hair, causing its disruption. Similar cases of beard disease have been reported in this country. It seems impossible to extirpate the fungus with ordinary remedies, and the only course left is to resort to the razor.

### THE AMERICAN TUBE WHEEL.

The simple and expeditious plan for obtaining water, by driving into the earth an iron tube having numerous small holes near the bottom, closed by an inverted cone of steel, which was used with great success by the Union army during the late rebellion, has been put in operation in France, under the Emperor's personal supervision. The British Government, after testing them at Aldershot, have sent a special brigade, having charge of these portable wells, with the Abyssinian expedition.

### IMPROVED COKING PROCESS.

Messrs. Carver & Co., of St. Etienne, France, have successfully utilized the gases given off in converting bituminous coal into coke. The gases are collected, drawn off through pipes, and cooled. From the liquids condensed, benzine, napthaline, sulphate of ammonia, and several dye-stuffs are made, and the uncondensed gas is used for illuminating purposes. The process is said to give a profit of fifty cents per ton, and if applied to all the coke made in France would effect a saving of $2,000,000 annually.

### BLIND BEETLES.

M. Ch. Lespés has published a memoir on coleoptera inhabiting caverns. He examined specimens belonging to five distinct families of beetles taken from caves, and was unable to discover even rudimentary eyes in any of them. The optic nerve appears to be undeveloped: the cerebral ganglia lie parallel to each other, and have the form of two simple oval bodies, like those found in certain blind larva which, when fully developed, do possess eyes. The absence of eyes in these beetles, as well as in the fishes of the Kentucky Cave, which live in a world of darkness, indicate an arrest of development caused entirely by external conditions.

### ANNATO.

W. Stein has examined annato, prepared by De Vry, in Java, from fresh fruit, by treatment with alkaline water and supersaturating with sulphuric acid, and finds that it gives an acid infusion containing a bitter principle, which may be removed by charcoal, and another substance which reduces the salts of copper. About one-half of the mass is fat and the residue is soluble in caustic and carbonated alkalies. Solutions thus formed, on the addition of acids, yield impure bixin, which appears to contain nitrogen in combination and which, either alone, or after dissolving in alkali, and adding a small quantity of ammonia, gives off the odor of musk.

### NEW CARBONATE OF SODA PROCESS.

M. Kessler has patented in France the following simple and apparently economical process for making carbonate of soda (*sodemarit*). Common salt (*sodamad*) is first intimately mixed with sesqui-oxide of chromium (*chremit*) either alone or with oxide of manganese (*manamat*). Chromate of iron or chromate of lead may be used and perhaps a good chrome iron ore. The ingredients are heated to redness in a furnace and subjected to a current of steam. The hydrogen of the steam unites with the chlorine of the salt forming hydrochloric acid. When the evolution of hydrochloric acid gas (*galad*) ceases, the charge containing chromate of soda is withdrawn, and, after being mixed with a proper proportion of coal, is again heated without steam, when sesqui-oxide of chromium is reproduced, and the carbonate of soda thus formed is separated by lixivation. The sesqui-oxide of chromium is again ready to be mixed with salt and may be used for an indefinite time.

## *ROAD LOCOMOTIVE.*

Mr. R. C. Vernol, exhibited a very curious brass model of a locomotive, which in its movements imitates walking. Its weight rested in front on two wheels, and behind on four levers or legs; one at each side being at rest while the other two were in motion. The foot of each leg or lever was grooved so as to take hold of the ground. The motor of the model is a spring which on being wound up, made the machine walk off " like a thing of life." The inventor asserts that a full-size wagon could be thus moved at a rate of twenty miles an hour. The model certainly performed well on the table, but doubts were expressed as to the performance of a heavy wagon on a soft or muddy road. There was necessarily a raising and falling of the hinder part of the locomotive, which indicated that there were conditions of motion, which would not be agreeable to passengers in this mode of conveyance. The meeting was apparently gratified with the ingenuity displayed by the inventor, but evidently it doubted the practicability of this plan of locomotion.

## *IMPROVED LATHE CHUCK.*

Dr. Warren Rowell exhibited Wm. Haight's improved lathe chuck. Its peculiarity was its great strength, range of opening and true centering. The jaws are drawn apart in two inclined planes, and the whole inner surface of the jaws bears upon the drill and holds it very firm. It will hold drills from a half an inch to those of the very smallest diameter. It centers the drill very perfectly.

## *FIRE-ESCAPE CARRIAGE.*

Mr. Oscar Burton, exhibited a new hook and ladder carriage, combined with a fire-escape. He stated that the longest ladder now used by the fire department of this city was forty-five feet; but the ladder connected with this carriage, could be extended upward sixty feet; the elevation of the folding sections of ladders was done by a crank movement. One commendable peculiarity of this invention is, that the ladders may be so placed as to form a platform on a level with the fourth story of a house, which is capable of supporting several firemen. The ladders can be raised to the height of an ordinary six-story house in three minutes. The apparatus was evidently approved of by the meeting.

## *NEW STEERING PROPELLER.*

Mr. F. G. Fowler exhibited a model, and spoke as follows:

This propeller, as its name implies, combines propelling and steering in one apparatus. As a device, it is entirely novel, belonging to no type or class of propellers in existence at the present time, and having no precedent in the history of propulsion. In its construction it would seem to resemble the paddle wheel, being formed with radial arms and feathering blades, while its mode of propulsion is like the screw, being a submerged wheel, and acting on the "sculling principle;" that is, by inclined planes passing latterly through the water, or by striking the water a glancing stroke; yet, on the whole, it differs materially from either. 1st. In the plane in which it revolves, revolving in a horizontal plane, while other propellers revolve in vertical planes. 2d. It dispenses with the rudder, while other propellers require that as an essential part. 3d. Other propellers require to reverse the engine, when backing the boat, while this wheel turns in the same direction when the boat is backing, that it does when the boat is going ahead. 4th. Other propellers can exert a propelling force, but in two directions, namely, directly ahead and directly astern, while this propeller can exert a force in an indefinite number of directions, either forward, backward or laterally, or to any point of the compass. 5th. Other propellers in turning the boat upon the center, require two wheels, acting in the water at different points and in opposite directions, while this propeller with a single wheel, acting in the water at a single point, is enabled to turn the boat exactly on the center. 6th. This propeller is capable of moving the boat side foremost, while other propellers are powerless to produce such a result.

These features, it will be seen, by those familiar with the subject, are sufficient to establish a definite line of demarcation between this and other propellers.

### THE WHEEL

Consists of a vertical shaft, from which proceed four sets of horizontal arms, to the extremities of which are attached four vertical blades. These blades are attached by pivots placed on their vertical central line, and have an oscillating motion of about sixty degrees, which is produced by feathering-rods, which are attached to the rotating strap of a stationary eccentric. Their inclination is such, that they propel by pushing on the water during the latter half their circuit, and pull during the remainder of their circuit, with the exception of two indefinitely brief periods when they are changing from a pushing to a pulling force, when they are neutral. As they near these points, and their lateral motion becomes slower, their pitch becomes correspondingly coarser, so that they are pressing on the water with equal speed during their entire circuit. The blades while in the after position of the circuit, are seen to have a pitch somewhat coarser than in their forward portion. This is as it should be, as they are acting on water that has received some motion. This corresponds to what is known as the "expanding pitch" in a screw.

### THE ENGINE

May be described as being of the simplest form of a horizontal steam engine, consisting of merely a frame, cylinder and valve, there being no reversing gear, as the engine is not required to run in but one direction. It is attached directly to the upper end of shaft without any intervening gearing.

### STEERING AND MANŒUVRING.

The eccentric is not absolutely stationary, but by suitable connections between it and the adjusting lever, it may be turned in any direction by the steersman, and this has the effect of casting the propelling force of the wheel in the same direction.

For example, if the adjusting lever is turned ahead, the propelling force of the wheel will be cast in the same direction, and the boat will move ahead. If turned aft, the boat will move aft. And so of any other point of the compass. The steersman has only to turn the adjusting lever in the direction he wants the propelling power cast. By slightly inclining the adjusting lever, the boat may be turned gradually to the right or left; by further turning it, the boat may be turned in the shortest and most abrupt curve, even to turning on its own center, and in its own length of water, a movement which is invaluable for naval vessels, or for any others which have not much sea room. By reversing the adjusting lever, which can be done in less than one second of time, the wheel is exerting its full propelling force backwards. This can be done from ten to thirty times, while the ordinary propeller is being reversed once. This feature, in connectien with its ability to turn in very short curves, might be the saving of many vessels in cases of collisions and running aground.

By the action of the wheel, we are enabled to throw the boat up alongside the dock, saving the use of capstans, and the employment of a large number of hands, and doing the work with more facility, the power of the engine, acting through the wheel, being more effective for that purpose than the strength of men acting through a capstan. By reversing the direction of the wheel's force, the stern can be thrown from the dock, and the vessel changed side for side, when it is desired to take on cargo from the opposite side. The stern of the vessel can also be thrown to or from the dock, greatly facilitating its departure.

In the capacity of a tug boat, towing a vessel of larger size, we are enabled to produce a direct side movement of both vessels, without any turning of either. This movement other propellers are incapable of performing, and would be of great value to tugs, more especially in such localities as Chicago river or Buffalo creek, where this side movement is often required, and there is not room to "straighten out."

### ROOM.

The machinery for this propeller occupies less room than that of ordinary propellers, and it leaves it in larger apartments. The engine is located aft in an unusual part of the vessel, which is divided into only two apartments by the boiler, while in the screw it is divided into three apartments by the boiler and engine, which occupies the space most required for carrying purposes, and a large share of extra space is occupied by the shaft of the propeller.

### WEIGHT.

Respecting the weight of the machinery, the wheel being made of steel is much lighter than a screw made of cast iron, where both possess the same strength. And there is a further saving, by the simplicity of the engine and by dispensing with the ponderous shaft, which extends a good part of the length of the vessel, when provided with a screw.

### DRAUGHT.

It also has the advantage of the screw in draught of water. As much propelling power can be obtained in four feet of water as in eight feet of water with the screw. By this means we are enabled to construct boats with light draught, to which can be imparted a high speed; and to navigate shoal water where the screw would be impracticable.

### STRENGTH AND SAFETY

Are an essential feature in any propeller. In this we claim superiority. First: in the employment of steel in its construction. which is six times as strong as cast iron.

In the paddle wheel and screw the strain is multiplied by leverage, or momentum and concussion; while in this propeller the parts are so peculiarly arranged that they are subjected only to direct tension and compression, with no leverage or shocks of any kind. We not only have a stronger material for its construction but have from one hundred to three hundred per cent less strain upon the parts.

Second: we have four chances instead of one in case any accident happens to the steering aparatus. If the rudder is disabled, the boat is uncontrollable. But if one of the blades of this propeller is disabled, there are three left. If two are disabled we have two remaining. And if we have but one we can control our boat and keep on our course, as each blade is independent of the other.

The blades being in a vertical position there is no lashing the sea and straining the boat as the stern rises and falls in a seway; and in case of leakage at the shaft, the boat will not sink as the apparatus through which the shaft passes into the boat is above the water line.

The wheel is in a less exposed situation, not coming so near the surface of the water nor extending to such a depth into the water as the screw, though of the same propelling powers. For this reason it is more securely below ice and other obstructions floating on the surface of the water; and not so likely to come in contact with rocks or objects upon the bottom of shoal waters as the screw. True it has more lateral extension than the screw, but this is the direction in which there is the most room and least exposure.

### SIMPLICITY OF MACHINERY

Is a marged feature, when it is taken into account the number of results produced. Let us suppose that the screw is so arranged that it can turn in its own length of water, and back without any liability of sticking its engines on their centers. To do that it will require two propellers and two double engines. How does a comparison with this stand? For one wheel on this you will have two wheels on the screw. For one cylinder on this you will have four cylinders on the screw. For two eccentrics on this you will have only eight eccentrics on the screw. And for the absence of any rudder or reversing gear on this, you will have one rudder and four reversing gears on the screw. And in general there will be about four times the complication of machinery on the screw that there is on this, and yet this will be capable of producing a great variety of movements, such as throwing the stem and stern from and to the deck, moving the vessel side foremost, etc., that the screw with all its complication of machinery will be utterly incapable of producing.

### RESISTANCE.

We are enabled to greatly reduce the resistance of the boat and wheel, as compared with the screw. First: by bringing the stern of the vessel to a sharp edge, which besides diminishing resistance gives the wheel a "cleaner run." Second: the wheel being constructed of steel, the parts are thinner and sharper, and cleave the water with less friction. Third: the rudder and rudder post are dispensed with, which, by dragging in the current produced by the screw produce much resistance. Fourth: this propeller may be constructed with two blades, and these being brought to the neutral point in their circuit will pass edgeways through the water, when the boat is under sail, producing but a tithe of the resistance that would result from the fixed blades of a screw under the same circumstances.

## *WILLARD'S STEAM PLOW.*

Mr. Geo. Willard exhibited a model of his steam plow or cultivator. A full-sized machine having lately been tried near Chicago, Illinois, with success. The inventor spoke as follows:

A long time since, perhaps shortly after Adam vacated Eden to earn his own living, and for aught I know to the contrary, it might have been he, who, for himself and wife, wished to improvise a garden of his own, that he might raise a few vegetables for winter use, and some corn to pop in the long evenings, invented a plow. For a long time, no doubt, it was a sore puzzle how to uproot tall rank grass and weeds—for outside of his first habitation, as I take it, to use a western term, all was raw prairie. But our ancient relative was equal to the task, and conceived the brilliant idea of sharpening a stick, or perhaps the limb of that identical apple tree, and with a thong attached to it and a cow, an ox or an ass, with the inventor at the other end to keep its and his own equilibrium, if he could, and may be with his loving spouse to drive, proceeded to plow.

Invention has not developed so fine results in the science of plowing, as in many others since his time. True, the sharpened stick has gone through many changes—transformations and conformations, and but few, if any reformations—and culuminating, after being shod at toe and heel with iron, in a splendidly finished cast-iron or cast-steel wedge; to be drawn through the earth by from two to a dozen horses or oxen—the cows being no longer beasts of burden—turning it to the depth of from two to eight inches, completely bottom side up, but so compressed by the wedge as to be useless, especially in the lighted till, until a season of sun and frost has decomposed and upheaved the earth, and at the rate of one and a half to three acres per day, according to the nature of the till, and not restricted by the eight hour law. It would be creditable also to our farmers, if while relieving the cow from her onerous duties, to also restore woman to her proper sphere and be no longer permitted to do farm labor as hired help, as is the case on many of our western farms, in the ratio of three women to one man.

Better harness up that most useful and unwearing agent *Steam*. and make it do all the work. Tilling the soil, planting the seed, and harvesting the crops so that farming should become a pastime instead of a dreaded labor, almost as tiresome in contemplation as back-aching in execution.

But I would not perpetuate the use of the wedge or sharpened stick in any of its forms or applications; nor would I build traction engines, as such, to overcome an anchorage capable of mooring the largest ship or shoving a ponderous structure; nor yet would I station an engine or engines with anchors, stakes, chains and cables, and a corps of assistants, equal to a traveling menagerie, with all its paraphernalia, to force that interminable wedge through the surface of the earth, and that not economically. But the soil must be tilled to the last acre within the possible efforts of the farmer, with any and every implement, and he often fails to get ten acres when he would have fifty. A case in point is that of Mr. Sullivant, of Livingston, Illinois, who last year moved on to a new farm of 45,000 acres, and while building a mansion, ditching and hedging his farm, proposed to do but little planting, being quite disorganized by moving, and so advertised for the breaking up of 5,000 acres on contract, 800 only of which were accomplished. His successors in Champange county, the Messrs. Alexanders, accomplished 3,000 in the same time, and proposed to break up 15,000 this year, for which their agent, Mr. Eaton, offers contract.

These few suppositions and facts may suggest an improved steam tiller or plow, and a great many of the advantages to be gained. But the field is so vast I will not attempt the argument, but submit a model of my method of applying force to resistance, as in steam plowing, in which the powers are so nearly balanced that I must really ask of you, where is the lost power?

This model is almost an exact imitation of a large machine, built under my superintendence, by the Willard Steam Plow Manufacturing Company, of Chicago, having an upright boiler thirty inches in diameter, five feet high, with forty-three tubes, and two five-inch cylinders, of eight-inch stroke, designed to make two hundred revolutions per minute, registering ten horse-power. The length of tuck is nineteen and a half feet, extreme width seven feet four inches—the whole weighing nearly or quite five tons, and carrying six cutters or spades of thirteen inches in width, making a complete till, ten inches in depth, six and a half feet wide.

This work was done in fallow ground, and without cutters or harrow teeth, while the shafts carrying the pitmans and spades were rotated from fifty to eighty times a minute, making a six-inch cut at each revolution, and apparently able to do a great deal more, had her gearing and capacities permitted.

This work was performed with steam varying from forty to sixty pounds, and when, after pumping cold water in her boiler and her fires extinguished, she still struggled, but succumbed at twenty pounds of steam. Thanksgiving day intervened between this and a northwest snow storm, which closed our field of operations and experiments, as well as our gauge cocks, pumps, pistons and valves with ice, and the season of the inventor, with many regrets.

## *FOUNDATIONS.*

The following paper, on the Resistance of Piles, was read by Hamilton E. Towle, Civil Engineer, New York city:

Sometimes in constructing foundations, the engineer has to provide resistance to a vertical force, acting alternately in either direction. The more frequent cases are those in which the force acts downward from insistent weight, as in the case of piers of bridges, and foundations of fortifications and buildings. Nearly all the published data and results of experiments on foundation piles are with special reference to their capability to resist sinking, and to form a solid support for some weight above; but occasionally the case presents itself in which the foundation must resist an upward force only, and in some less frequent cases the same foundations may be subjected alternately to an immense weight resting upon it, and to a corresponding force operating in a diametrically opposite direction.

In the case where the natural bottom is rock, resistance to the downward pressure is already provided for, and the upward force can also be readily resisted by the simple expedient of iron or copper bolts, inserted in holes drilled into the rock, and then secured by the method known as fox-wedging, or by forming the lower end of the bar into a "lewis," and when the place is free from dampness further security is sometimes given by pouring into the interstices melted lead, for which sulphur or cement is occasionally substituted.

The propriety, however, of placing two different metals together is very doubtful, except for temporary purposes, when the galvanic action may be disregarded.

Bars or rods so employed are termed *holding-down bolts*, and are not properly within the subject of foundations, though intimately connected with it, as can be readily seen.

The cases to which I more particularly wish to call attention are those of foundation piles having to resist an upward strain in direction nearly corresponding with the longitudinal axis of the pile.

Experiments upon piles in this relation are very meagerly recorded in the books, and as such experiments are always expensive, and their results very valuable when accurately recorded, it seems to be the duty of every engineer possessing such records to place them where they will be permanently recorded, and can be made available, especially by the profession.

The experiments which I am about to describe specially, were made in 1851 at the United States Navy Yard, Pensacola, Florida, and were ordered by Commodore Joseph Smith, Chief of the Bureau of Yards and Docks (now Rear Admiral Joseph Smith), to enable the Department to determine how much lifting force each of the wooden piles, to which were secured the timber bottom of the floating dry dock basin, was capable of resisting.

A copy of the order of Commodore Smith to the commandant of the navy yard, is as follows:

[*Copy.*]

BUREAU OF YARDS AND DOCKS,
*8th May*, 1851.

CAPTAIN—You will please call upon the engineer of the yard for a report stating the average depth to which the foundation piles in the floating dock basin have been driven into the sand, the weight of hammer used, the number of blows, the fall of the hammer, and the last blow given, and the amount of the settlement of the pile by the last blow.

You will also have six of the piles, which were first driven, drawn up, provided they can be drawn up by the application of a power not exceeding ten tons, carefully noting the amount of power required to draw the piles in each case. If the application of a power equal to ten tons to each of the six piles will not draw them, then let one pile be drawn to ascertain *how much* power is required for the purpose.

The result of these experiments will enable the Bureau to judge whether the foundation is of the most solid construction, according to the nature of the soil, and intention of the contract.

Respectfully,
Your obedient servant,
(Signed.) JOSEPH SMITH.

Capt. Jno. Thos. Newton, *Commanding Navy Yard, Pensacola.*

As I had the pleasure of assisting at these experiments, I am able to present the following facts, which were carefully noted at the time:

The material into which all the piles were driven was sand, clean, sharp, homogeneous, granulated silica, quite free from dirt or any kind of pasty material.

There was no rubbish, vegetable deposits, pebbles or stones of any kind, and all the sand would pass through a sieve, having openings one-twelfth of an inch square.

The piles were of yellow pine, thirty feet long, averaging thirteen inches diameter at the middle of their length, round, and driven with the bark on.

The points were sharpened to the form of a square pyramid, two feet to two and a half feet in length.

Every pile was banded with a hoop of best bar iron, three by one inch in section, and driven in all cases without a follower.

The average weight of the piles was 1,500 to 1,700 pounds.

The piles were driven four feet apart in water about eleven and a half feet deep.

Average depth into compact sand, fifteen feet.

Average number of blows given each pile, with a ram weighing 4,087 pounds, was sixty-nine.

Average ditto, with a ram weighing 4,478 pounds, was sixty-four.

The ram falling thirty-three feet the last blow, and all the blows given at the rate of two and a half per minute.

Long experience in driving piles in the compact sand of Pensacola harbor, showed that the limit of endurance of a yellow-pine

Fig. 1.

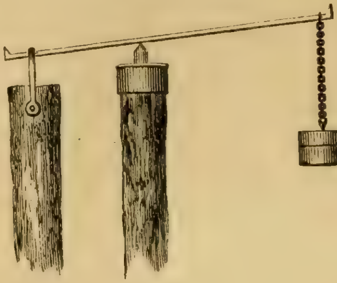
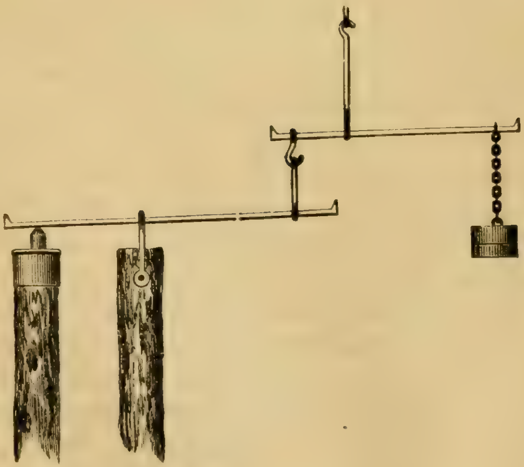


Fig. 2.



pile, thoroughly banded, is with a two-ton ram, to a depth of about fifteen feet.

At this depth the pile caused the hammer to rebound nearly a foot at the last blow, and the destruction of the pile itself begins to take place by shattering and brooming at the upper end.

The first experiment to test the resistance to a withdrawing force, was tried 17th May, 1851, when a lifting strain of 23,850 pounds was applied to one pile for five minutes without moving the pile. In this experiment a lever of the first order was employed, one foundation pile forming the fulcrum, and a large pile hammer placed on the long arm of the lever producing the power as shown in Fig. 1.

The second experiment was made by applying a power of 20,000 pounds to another pile, with a lever of the second order, with a steelyard to weigh the power at the long arm of the lever, as shown in Fig. 2; and this method of applying the power was applied to all other experiments.

The third pile was then subjected to the same strain for five minutes.

The fourth pile was then tried, and resisted the same strain for five minutes. There was then applied to this pile fourteen tons for several minutes.

Three other piles were subsequently tried, and each resisted ten tons lifting strain applied for five minutes.

On the 23d of May, the experiment of pulling a pile was commenced, beginning with ten tons (applied to No. 4, as before mentioned), and increasing the power one ton every two minutes, that is, after ten tons had been applied for two minutes, eleven tons were applied two minutes, and then twelve tons, and so on until fifteen tons had been tried, when a hook of the steelyard broke. After improving the apparatus for increasing the power, the experiments were resumed, beginning with ten tons again and gradually adding ton by ton, until there were thirty-one and a half tons upwards or lifting strain applied to the pile. This experiment lasted one hundred minutes; during the whole of this period the lifting force was constantly applied. There was afterwards a gradual increase of the lifting force to thirty-nine tons, without moving the pile; it then resisted forty tons for half a minute, when it began to rise very slowly. Forty-one tons were then applied for one hundred seconds; then forty-one and a half tons for thirty seconds, the pile meanwhile moving upward very reluctantly at the rate of only one-twelfth of an inch per minute.

The experiment of trying 40, 41, 41½ tons occupied half an hour, during which time the strain being incessant, the pile was moved two and a half inches.

This same pile was then subjected to a strain of thirty tons for eighteen hours, and was not moved by it. After which, by increasing from thirty-two to thirty-seven tons, the pile was moved in one hour, three inches, and after it had been moved upward about six inches, a lifting power of twenty-five tons continued to remain on it for two days, and did not move it. Commodore Newton then pronounced the experiment complete.

This pile was then wholly withdrawn from the sand, and its dimensions, &c. were found to be as follows: Material, yellow pine of Florida; extreme length, twenty-nine feet, perfectly straight; in sand, including sharpened point, two feet long, sixteen feet; weight of the pile, 1,632 pounds.

The bark remained on the entire pile, except three and a half feet of its point; it was somewhat smoothed apparently by the friction of the sand.

There was no sand adhering to the pile, except on the sides of the sharpened point; here was a little brown-colored sand stuck on very hard; it appeared like sand mixed with the turpentine of the wood.

The probability is, this pile would have resisted a much greater strain than forty tons, had it been applied more steadily, and without jarring the lever, and had all the work of pile-driving in the vicinity been stopped. The blows of the pile hammers being used, jarred the crust of the earth for several hundred feet around.

A single foundation pile similar to that drawn out, was used as a fulcrum, and sustained without settlement 38 $\frac{96}{100}$ tons, much less than its full bearing capacity. It gives us, however, a fact.

The United States fortification, named "Fort Montgomery" (Lake Champlain), is entirely founded on piles. The bottom was nothing unusual, in fact an ordinary average of a mud bottom, such as is found in the edge of a lake immediately bounded by a swamp.

The piles there, were of an average length of thirty-one feet, average diameter twelve inches, They were driven about thirty feet into the earth, by a ram weighing 1,630 pounds, falling the last blows thirty-three to thirty-six feet.

The last blows produced a penetration of from two to five inches, averaging about three and three-quarter inches.

The weight of the piles were estimated by Colonel Mason, to be nine hundred and sixty pounds each. According to the formula adopted by him and given below, in which

$W$=weight of the ram in pounds.
$W'$=weight of the pile in pounds.
$h$=height in inches ram fell last blow.
$d$=depth in inches of penetration from last blow.
$R$=retarding force of the pile.

Formula: $$R = W + \frac{W}{W + W'} + \frac{h}{d},$$

which gives, after substituting the figures, the value of R=118,175 pounds for the above average weights and measurement.

These piles had actually been loaded with 28,575 pounds for a number of years, when I left the work, without the slightest indication of settlement; this should be the case, inasmuch as they are only loaded to one-quarter of that weight, which the force of resistance is capable of holding in equilibrio, according to the above formula.

Many cases have come under my observation in which, after a pile had been driven and remained undisturbed for a longer or shorter period, another blow was struck with the invariable result of less motion than was to have been expected if this blow had immediately succeeded the others; and there is reason to believe that the vertical force necessary to withdraw a pile becomes materially greater the longer a pile remains driven and undisturbed.

Respecting experiments, I cannot do better here than repeat the exact language of my lamented friend, Mr. Warren Q. Dow, Civil Engineer of the Government at Pensacola Navy Yard, who said, after the experiments at that station:

"In experiments made to determine the comparative settlement of piles, note should be made of the time which passes between the successive blows of the hammer.

"The results of a few experiments on these piles show that piles which six-tenths of an inch per blow of a 4,087 pound hammer, falling ten feet one day, were found to settle one-eighth, one-half, six-tenths inch by three similar and successive blows applied the following day—the three blows being given in a minute."

This increase of resistance or "setting" of piles by a delay after driving, corresponds to my own experience respecting piles in all other kinds of earth material, and is, after all, only an illustration of the well established law that the co-efficient of the friction of repose is in all cases essentially greater than that of motion.

### *SYRACUSE SALT WORKS.*

Mr. R. G. Overton gave a very interesting account of the various salt works at Syracuse and in that vicinity, which he had lately visited. The whole amount of salt produced since the year 1797 is 80,000,000 bushels. Six pounds of salt are obtained from 100 pounds of brine, which is pumped up from a depth of 300 to 350 feet. Last year about 7,000,000 pounds of salt were made, which is about one-third of all used in the country. Before 1862, considerable impurities were found in the salt, but since that time chemists have introduced improvements for purifying it, and now the salt is of the highest character.

Dr. Vanderweyde remarked that as high as fifteen per cent is sometimes obtained of pure salt. Sea water contains considerable chloride of calcium, which absorbs moisture; this was also an objection to Syracuse salt, but this with other impurities are now abstracted, and pure chloride of sodium (common salt) is produced.

Dr. John F. Boynton corroborated the statement regarding the purity of the Syracuse salt. It is now even better than the best qualities of foreign salt. Adjourned.

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## February 27, 1868

Professor S. D. TILLMAN in the chair.

The following items of scientific news were presented by the Chairman.

### THE NERVE OF NERVES.

It was lately announced at the French Academy of Science, that M. Sapey, had discovered the *nervi nervorum*, known to exist, but which had not been before distinctly traced. On examining the mucous membrane with the microscope, he found around each nerve minute fibrous nerves, inclosing a canal in which the nervous pulp was lodged.

### HOTTINA.

This powder, invented by M. Hottin, of Paris, will make linen fire-proof without impairing its whiteness, when mixed with equal quantities of starch and gum. The powder is prepared by adding a little ammonia to an acid solution of phosphate of lime, and filtering with animal carbon, then evaporating until concentrated, when five per cent of gelatinous silica is added; the whole is then evaporated and the resulting crystals are pulverized.

### ANIMAL MECHANICS.

The Rev. Samuel Houghton, of Trinity College, Dublin, already favorably known to the scientific world by his investigations relating to animal physiology, has lately furnished new proofs that the force of a muscle is proportioned to the area of its cross section, and that of the tendon which conveys its power to a distant point. He estimates the contractile force of muscle generally at 109.4 pounds per square inch of cross section.

### POWDER FOR CLEANING JEWELRY.

The high price of an excellent powder much used by European jewelers in finishing and polishing gold, induced Dr. W. Hoffman to analyze it. He found it consisted of seventy per cent of oxide of iron, and thirty per cent of chloride of ammonium (sal ammoniac). It is made by subjecting iron to the action of hydrochloric acid. After the hydrogen gas has ceased to escape, a solution of sal ammoniac is added. The precipitate is filtered at a very low temperature to prevent rapid evaporation,

### EFFECT OF ANTISEPTICS ON ANIMALCULÆ.

By allowing colpoda, found in vegetable infusions, to come in contact with antiseptics while under the field of the microscope, Dr. Binz, of Bonn, has discovered that two kinds of destructive action ensue. Chloride and hyposulphite of sodium, chlorate of potash and alum, by osmotic action, caused the creatures to burst; while a directly poisonous action was produced by nitric, sulphuric, acetic, and tannic acids, permanganates, creosote, corrosive sublimate, quinia, chlorine, bromine and iodine. Acetic acid and quinia produced the most powerful effect. Neither salacin nor nitrate of strychnia exerted any immediate influence.

### SOLIDIFICATION OF BISMUTH.

Mr. Alfred Tribe has been experimenting with bismuth, to ascertain the correctness of Professor Tyndall's statement, that the anomalous expansion of water in the act of cooling below 4 degrees C., or 39.2 Fah., is by no means an isolated instance of the kind, but that other bodies and particularly molton bismuth, participate in this extraordinary property of expanding near the point of solidification. Mr. Tribe, in a paper read before the London Chemical Society, expresses the opinion that the analogy between water and bismuth is imperfect, since in the case of molten metal, there is no perceptible range of temperature through which it expands on cooling. The act of solidification is itself accompanied by an increase of bulk, but there is no evidence of this expansion taking place prior to the act of crystalization.

### NEW SINGEING MACHINE.

Mr. J. A. Miller, of New York, has made an improvement in the processs of removing the nap or protuding fibers on the surface of cotton cloth before it is dyed or printed. Usually the cloth is passed rapidly either through a flame or over a red hot semi-cylindrical bar of copper. The new plan is to run the fabric between two revolving copper cylinders, which are kept at a white heat; by this means the downy coating is removed simultaneously from both sides, and the cloth can be passed automatically and continuously through the several processes of singeing, bleaching and printing. Another common process is to remove the nap by shearing, but the fabric is liable to be injured in this way. Cloth prepared by the burning process presents a smoother surface, and when printed its colors are clear and brilliant.

### INDUCTION COIL EXPERIMENTS.

The Paris correspondent of *The London Chemical News* described some interesting electrical experiments made by M. Rondel of Brive. If, while the current of a pile passes through the primary wire of a coil, one of the extremities of the secondary wire is brought near one of the extremities of the iron core, sparks can be drawn of remarkable intensity and brilliancy; if, at the same time, the other end of the secondary wire is put in communication with one of the poles of the pile, a great increase takes place in the brilliancy of the spark. Then on touching with the hand the iron core, and placing the free end of the wire in contact with the skin, a redress takes place, and a smart, stinging sensation is felt. This last experiment was made upon a coil, the core of which completely isolated in a glass vessel, was eight millimeters in diameter. M. Rondel made the same experiment with another bobbin, the soft iron core of which was twelve centimeters long, five wide and eight thick. The sparks were produced with detonations. A single Bunsen element of small size was sufficient to produce these phenomena. When two recipients are charged with mercury and water, and fragments of iodine are added, no effect is perceived; but if a small piece of zinc is allowed to fall into the mercury, the fragments of iodine are instantly set in motion and are rapidly dissolved. This solution, poured off clear, serves for many uses. M. Rondel has employed it concentrated, for the supplying of a pile mounted in a closed flask, also for the preparation of a fine red iodide of mercury.

### THE PHENIC ACID REMEDY.

Phenic acid, (*earlat*) which has produced of late some remarkable results in hospitals, has also been employed with success on the farm. Dr. Calvert, in a recent lecture said that carbolic (phenic) acid is now used in England for the cure of certain diseases common to sheep—scab, for example. The method of treatment customary in similar cases was very imperfect as well as dangerous, while with carbolic acid this malady is cured, and without danger to the animal, by dripping it for a minute, often only for some seconds, in water containing a small quantity of carbolic acid. For this purpose pure acid would be too expensive and is not used, nor is concentrated acid, which ignorant men who have the care of sheep would not know how to use, but by the help of soap an emulsion of carbolic acid and cresylic acids is made. After having shorn the sheep it is dipped in this mixture; a single emersion in a bath containing one-sixtieth of it is sufficient to effect a cure. Phenic acid is also an efficacious remedy for foot-rot. For this, a mixture is made of the acid and an adherent and greasy substance, capable of forming a plaster, which is made to adhere to the animal's foot for two or three days, preventing the contact of the air, allowing thereby time for the application to have its effect. But if the flock be numerous, it would take a long time to dress the feet of each animal one after another, so to make it more easy, a shallow tray is made of stone, a sort of trough; this is filled with the medicated mixture, and the sheep made to pass through it; their feet being thus impregnated with the required substance. Cattle cease to be annoyed with flies if washed with a very weak solution of this acid. A valuable salve is also made by adding about sixteen per cent of phenic acid to butter or other fatty matters used for such purpose.

### PACKING FOR STEAM JOINTS.

Mr. J. A. Miller has remedied a difficulty long experienced by engineers in keeping steam joints tight for a long time, without expensive rubber packing, by placing a thin sheet of muslin between the flanches of the pipes, which are previously painted. The muslin is a receptacle for the paint, holding it in place, and preventing the steam from blowing it out, which is usually the case when paint alone is used. The paint preserves the cloth, and thus makes a permanent packing.

### TO DESTROY INSECTS ON FRUIT TREES.

A writer in *The London Journal of Horticulture* says that either common alcohol or mythylic alcohol (wood spirit), as a wash, will destroy the wooly aphis and other insects on fruit trees more effectually than soft soap, sulphur wash, or any other compound generally used for that purpose.

### PAPER BELTS.

The latest use to which paper has been put is its substitution for leather and vulcanized rubber in belts for driving machinery. The new belt consists of layers of paper cemented together in such a manner as to be little affected by moisture, or heat at ordinary temperatures. Those who have tried it during the last six months report that it does not stretch, and on account of its cheapness, it is preferred for light machinery.

### THE COMMERCIAL IRON ORES OF GREAT BRITAIN.

Robert Hunt, F. R. S., keeper of the Mining Records of Great Britain, publishes the following list of the varieties of commercial iron ore produced and used in that country, showing the average percentage yield of iron of each variety, and the proportions in which they are employed in British iron manufactures:

| | Per cent of iron. | Proportions in which used. |
|---|---|---|
| Red hæmatite | 65.13 | 15 per cent. |
| Brown hæmatite | 41.40 | 13 per cent. |
| Oölitic brown hæmatite | 35.60 | 26 per cent. |
| Black band | 37.80 | 42 per cent. |
| Argillaceous ores | 30.68 | |
| Spathoes ores | 40.95 | 2 per cent. |
| Magnetic oxide | 56.10 | 2 per cent. |

It will be noted that only two per cent of the black or magnetic oxide (*ferrimot*), and fifteen per cent of the anhydrous sesqui-oxide of iron (*ferremit*) are produced; the remaining ores mentioned are not so rich in iron, being either hydrated sesqui-oxides or carbonate of iron (*fermarit*). Sixty-eight per cent of all the ores used contain less than thirty-five per cent of iron.

### SAPONIN.

This substance is found in common soap-wort, horse-chestnuts, quillaja bark, corn-cockle, Senega root, pimpernel, and the roots of pinks. It seems to be widely diffused throughout the vegetable kingdom, and is easily extracted from plants by means of boiling alcohol. Its name is derived from the saponaceous qualities of its solution in water. An infusion of soap-wort is sometimes used for cleansing the finer kinds of wool. Saponin is a nearly white, friable powder, of sweetish taste, and producing a scratching sensation in the throat. Its dust causes violent sneezing. A drop of its solution applied to the eye excites burning pain, and dilates the pupil. Eugene Pelikan, Director of the Civil Medical Department of Russia, lately sent to the Academy of Sciences, Paris, a note on the local paralysis produced by saponin and analogous substances. The result of his experiments may be briefly summed up as follows:

1. The local paralysis produced by saponin is followed by a rigidity of the muscles and paralysis of the nerves of sensation.

2. This local paralyzing action resembles somewhat that of substances acting on the pupil, like atropin, &c.

3. Saponin, now employed in medicine, is probably destined to perform another part than that at present attributed to it, and for this reason it should be submitted to new clinical experiments.

4. Saponin does not cause either contractions of the muscles or other parts to which it is applied, yet it annuls completely the irritability of the muscles, provided the animal submitted to its action is in the normal state of health.

### AMERICAN CONCRETE BUILDING STONE.

Recent improvements in the manufacture of concrete building blocks have so far perfected the product as to bring this stone into successful competition with the very best of the natural and artificial building materials. The action of lime upon silica, forming a silicate of lime (*calcmakit*), and thus binding together particles of sand, as in mortar, has been known from the remotest ages, and concrete walls of great antiquity are now standing, vieing with the natural rock in hardness and durability. Some years since a concrete block, compacted by pressure, was brought out in this country and used to some extent as a building material, but the slowness of the induration, and uncertainty in the product, hindered its general introduction. The improvements referred to consist in the use of heat in connection with quicklime and sand, by which the formation of the silicate of lime is hastened, and the same effect, which formerly took years to be consummated, is now produced in a few days. Ground quicklime is thoroughly mixed with clean, sharp sand, and is then subjected to the action of either superheated or high pressure steam, which slacks the lime, and causes it to attack the silica. This process continues for from twenty minutes to ten days, according to the degree of heat employed, when the material is molded and compressed by a heavy steam hammer into blocks of any desired form. The ordinary building block made by this process is ten inches wide and four inches deep, having a hollow space in the center six inches long by one inch broad; when the blocks are placed upon each other, so as to break joints, a continuous and connected series of air chambers will be formed within the wall. Thirty days exposure of the block, after it is first formed, to the air, produce an induration quite sufficient for all ordinary building purposes, but the block continues to harden for an unlimited period. A church built entirely of this material was recently dedicated at Morrisania. A number of fine buildings have already been constructed of this material in Chicago, among which may be mentioned a handsome block of dwellings on Sixteenth street, and the Young Men's Christian Association of the same city, which was recently burned. The endurance of this stone, when submitted to repeated freezing and thawing, is quite remarkable, and experiment proves it to be equal in this respect to granite.

### RICHARDSON'S PROCESS FOR MAKING STEEL.

Many of the puddling furnaces of Great Britain have lately been improved by the addition of an apparatus for blowing air into them, resembling that used by Bessemer in making steel directly from the ore. The application of the improvement requires no alteration in the form of the common puddling furnace, for it does not essentially change the old method of puddling; but by introducing air through the iron rake or rabble used to stir the metal, it reduces in quality or duration one particular stage of the process. Instead of numerous small holes in the blast-pipe or tubular rabble, to subdivide the current of air, there is one broad slit of rectangular opening, about half an inch wide, and three or four inches long, which is more easily kept free from slag. Two or three tubular rabbles are fitted to each furnace, to be used alternately, in order to prevent over-heating. Each one is connected to the air-receiver by long flexible tubes of India rubber. The air is turned on before the rabble is introduced, and remains on until it is withdrawn, in order to prevent the narrow aperture from being choked by cinders. By means of the blast rabble, the time occupied in bringing the molten iron to a "boil," has been reduced from thirty or forty minutes to ten. At the beginning of the operation, the sparks thrown off, indicate that silica is being separated from the mass, and as soon as the flame is clear, the tubular rabble is withdrawn and the common rabble is substituted. A number of experiments have demonstrated that the whole process from the time an ordinary furnace is first charged until the mass is finished, does not consume more than one hour and a quarter. The quality of the material produced is said to be superior, and in no case thus far has there been any failure to produce the desired results.

### ACTION OF ALUMINA AND OXYD OF IRON IN SOILS.

At a late meeting of the London Chemical Society, Mr. R. Warrington, jr., gave an account of experiments made by him, to determine the part taken by oxyd of iron and alumina in the absorptive action of soils. He used artificially prepared hydrates of alumina and sesqui-oxyd of iron, also two samples of native soil containing 6.82 and 19.31 per cent, respectively, of oxyd of iron (*ferremit*) and alumina (*alemit*). Through these he passed solutions of bone phosphate of lime, alkaline carbonates and sulphates, ammonia salts, &c., for the purpose of ascertaining the rate and extent of absorption. The soil used was first digested in weak acetic acid to remove all calcareous constituents, which would have interfered with the intended action, and then thoroughly washed with water, after which it was placed in contact with the lime phosphate, a current of carbonic acid being occasionally passed through it. At the expiration of a week, the soil was found to have withdrawn 93.8 per cent of the phosphoric acid, and only forty-nine per cent of the lime originally present in the solution, from which the author infers that alumina and peroxyd of iron possess a special affinity for this acid, and that all the phosphoric applied to land in the shape of manure, must ultimately become converted into phosphates of iron and alumina; and, if the proportion of iron be sufficiently large, all the acid will be retained by preference in the form of ferric phosphate. The author also found that the absorption power of soils for phosphate, sulphate, and carbonate of potash, was much greater than for nitrate of potash or chloride of potassium. The corresponding salts of ammonia behaved in a similar manner. In conclusion, he expressed the opinion that the absorptive action of soils was dependent upon true chemical affinities, in contradistinction to the view that it is the effect of physical attractions.

The president, Warren de la Rue, thought that caustic lime, so largely used by the farmer, would have great influence in absorbing phosphoric acid.

Prof. Way said there would be more difficulty in determining the degree of absorption of the carbonates of ammonia and potash than of the other alkaline salts named. The existence of the hydrate of alumina was a matter of doubt.. Clay is generally supposed to occur in the form of a double silicate of alumina, and many kinds contained lime, locked up in such a manner that it could not be extracted by acids, yet they had the power of absorbing ammonia without any apparent chemical change.

Dr. Volcker said the results of his experiments in the main agreed with those of Mr. Warrington. There was a kind of peroxide of iron precipitated by lime which behaved in an extraordinary manner as to the amount of phosphoric acid it could take up, and lime in a soil has great influence in absorbing ammonia, so also has the hydrated silica naturally occurring in soil, as well as other constituents, which had not been taken into account.

There was a remarkable tendency in nature for "the soil to take care of itself," and if there should happen to be a deficiency of any one ingredient, this was quickly remedied by a proper selection from the materials presented in the form of manure.

Dr. Gilbert said the experiments described seemed to establish certain points, but he doubted the applicability of these results to soils as they really exist. Mr. Warrington replied that when lime was present, with the oxyd of iron, these bases acted more powerfully, but in the same direction. It was only a question of time as to how much phosphoric acid would be absorbed in a ferruginous soil. Humus seemed to be capable of absorbing free ammonia; it was evident that each ingredient of the soil must be experimented upon separately.

### ADULTERATION OF DYES.

A correspondent of the *London Chemical News* says that common salt holds a prominent place among the substances used to adulterate chemicals for dyeing. It is well known that to dye an even fast and brilliant shade, the coloring matter must be held in a state of perfect solution; or if insoluble in the finest possible suspension, so that it may be slowly and gradually delivered to the fiber. Now the presence of salt impairs the balance between the solvent and the color, and causes the latter to be rapidly and irregularly deposited on the surface of the goods in a dull state capable of easy removal. Ground tumeric is another article often mixed with salt, which imparts to it a brighter appearance in the state of powder; and the action of the salt in this case is very similar to what has been previously described.

### REGULATING WATCHES.

The new observatory at Neufchatel, in Switzerland, has rendered good service to chronometer makers, by enabling them to regulate their watches with more exactness. Prizes are now given to those makers whose watches approach nearest to perfection. A marine chronometer lately tested for two months, gave 0.164 of a second as the mean variation from day to day. The improvement in common watches during five years will be seen by the following table of mean variations in twenty-four hours:

In 1862 the mean variation was........................ 1.61 sec.
In 1863 the mean variation was........................ 1.28 sec.
In 1864 the mean variation was........................ 1.27 sec.
In 1865 the mean variation was........................ 0.88 sec.
In 1866 the mean variation was........................ 0.74 sec.

More than three-quarters of the chronometers observed in 1866, gave a mean variation per day of less than half a second.

### CORROSION OF CAST-IRON.

The *London Journal Engineering* gives Grace Calvert of Manchester the credit of making, some time since, a series of experiments which resulted in the discovery that cast-iron under certain conditions, undergoes a loss of strength or cohesion without a corresponding alteration of volume or size—in other words, becomes rotten. Mr. Mallet, however, commenced this investigation, and deserves a higher place than Calvert in this connection. The phenomenon is entirely different from common oxidation or rusting, which affects only the surface of a piece of iron, by gradually reducing its size and correspondingly reducing its strength, while the interior portion remains intact. Mr. Calvert immersed cast-iron cubes, each one centimeter in dimension, in acidulated water. Each cube was placed by itself in a corked bottle, filled with eighty centimeters of very diluted acid. Among the acids tried were sulphuric, hydrochloric and acetic; their action upon the iron was very slow, and it required a long time to show any change whatever. After three months of contact, it was found that some of the cubes, and particularly that immersed in acetic acid, had become so soft externally that a knife-blade could penetrate three or four millimeters deep. The solutions were then removed, and replaced by fresh acid of the same kind in each bottle—this removal being continued every month for two years. After this length of time, changes had been effected in almost all the cubes, the penetration being more or less complete according to the nature of the acid. Next to acetic acid, in energy, came hydrochloric, then sulphuric acid. Phosphoric acid showed no similar action. The result of the action of other acids was a complete change in the nature of the metal, without any alteration of its bulk or appearance of its surface. The specific gravity of gray cast-iron cubes was reduced from 7.858 to 2.751. On analyzing the cube which had been exposed for years to acetic acid, and comparing its ingredients with those of gray cast-iron of the same quality as that composing the original cube, Mr. Calvert found that the quantity of pure iron had decreased from 95.413 to 79.960; of phosphorous, from 0.132 to 0.059; of sulphur, from 0.179 to 0.096; while the amount of carbon had increased from 2.90 to 11.07; of nitrogen, from 0.79 to 2.59; of silicon, from 0.478 to 6.07. Seawater contains the elements from which the destructive acids mentioned may be formed, by the decomposition of organic or inorganic matter present in such water. The gradual deterioration of certain kinds of cast-iron, when exposed to seawater, may be considered as established. This action is of course extremely slow, yet it should be taken into account in all engineering structures, relying for their safety upon cast-iron in contact with the seawater or any water which is the receptacle of acids. The experiments by Calvert confirm those made several years before by Mallet, who found that the corrosion of cast-iron depended upon a want of its homogeneousness of surface, density or hardness, or the imperfect combination of the carbon with the iron. The Institution of Civil Engineers in London, recently discussed this question at great length, and cited numerous cases where cast-iron, which had been immersed from thirty to forty years in seawater, was found wholly unaffected. Mr. Simpson, the president, stated that "the square angles of the iron were as sharp as when they left the foundery, and wholly uninjured." Mr. William J. McAlpine, a distinguished American engineer, says, that to resist corrosion, cast-iron should be hard, of an even, close grain, and with its carbon intimately combined, and not in the form of graphite. Impure, soft, foundery iron will corrode rapidly; close-grained gray iron will resist corrosion for a long period, while white iron, of good quality, is nearly imperishable.

### *ELECTRICITY IN MOLTEN IRON.*

Mr. A. H. Fleury said he had lately read an account of the use of a current of electricity passed through molten iron in the process of making steel, during some successful experiments made in France. The plan cannot be claimed as original by this experimenter, for he had done the same thing six years ago in Pennsylvania.

### *THE LATE SAMUEL H. MAYNARD.*

Dr. Feuchtwanger introduced resolutions of respect to the memory of the late Samuel H. Maynard, for many years an active member of the American Institute, and a regular attendant at the meetings of the Polytechnic. Mr. Maynard had never been entirely well since his return from Virginia. He served in the early part of the war as a captain in the Seventy-first Regiment of New York Volunteers. For many years he had been devoted to the business of bringing out new inventions, and was thoroughly versed in all the business of the Patent Office.

The resolutions were passed unanimously.

### *NAPHTHA AS A FUEL.*

A large part of the evening was devoted to experiments with a cooking range, in which the lighter products of petroleum are used as fuel. As the inventor had previously appeared at the Farmers' Club with the same apparatus, we refer to the proceedings of the Club for an account of its operation.

After a full discussion of the merits of this plan, in which the danger of keeping the lighter products of petroleum was fully set forth, the Association adjourned.

## March 5, 1868.

Prof. S. D. Tillman in the chair.

The following articles from the pen of the Chairman were first read:

### DIETETIC CONDIMENT.

For the prevention and cure of certain diseases, traceable to dietetic errors, Dr. Lankester adds to common table salt (chloride of sodium) small proportions of phosphate of lime, chloride of potassium, sulphates of potash and soda, and still smaller, of magnesian and iron salts. The object of the inventor will be understood by stating that consumption, scrofula, and softening of the bones are supposed to result from a deficiency of phosphate of lime and other salts; scurvy, from the absence of potash; and nervous disorders from a want of iron in the blood. This plan of guarding against human ills generally by a single condiment, reminds one of the early attempts to drive off disease, before a proper diagnosis, by administering a compound of numerous medicinal roots, in the hope that at least one of them would meet the case and prove an antidote; while all the remaining ingredients, finding their services were not required, would reserve their force and quietly withdraw from the contest, or at least produce no pernicious effect upon the patient.

### INFLUENCE OF COLORED LIGHT ON PLANTS.

Recent experiments by L. Cailletet confirm those made many years ago by Morren, of France, with regard to the influence of the luminous rays in vegetable growth. The former advances a step further by including the red, as well as the yellow ray, among those most favorable in promoting the decomposition of carbonic acid gas by plants. All the rays more refrangible than the yellow are powerless in this respect. Under the influence of green light, not only does no decomposition take place, but new quantities of carbonic acid are formed, the exhalation of the gas by the fresh leaf being nearly as much under this condition as when placed in the dark. Light passed through a solution of iodine in bisulphide of carbon, prevents decomposition of the acid, and the appropriation of carbon by the plant, but does not seem to increase the quantity of acid, which might be inferred from the fact that the violet is the most refrangible of the colored rays. Many experiments have been made in this country which give the same general results as those of Morren and of Dr. Daubeny, of England, but differ somewhat from those of Cailletet.

### PERSISTENCE OF VISION.

A new scientific toy has lately been added to the already numerous devices for producing optical illusion by rapid motion. It consists of a wire bent to coincide with the outline of one-half of a decanter, vase, or cup, which, when attached to a vertical axis, and made to revolve rapidly by means of gearing, gives a view of the whole object intended to be shown. This phenomenon depends upon the fact that the visual perception of an object does not terminate at the instant the rays reflected from it have ceased to enter the eye. It is accounted for very clearly by the undulatory theory of light, if we assume what is true in many other instances, that the organ acted upon by a vibratory force is, itself, set into vibration. Experiments have shown that visual perception continues about one-eighth of a second after the actual disappearance of the object, so that its reappearance within that time would prevent the eye from detecting its absence. It is, therefore, only necessary to revolve the wire of the toy alluded to so fast that every point in the outline of the object will be shown eight times per second; in other words, eight revolutions of the wire within a second will give the impression of the solid. It might, at first sight, be inferred that the parts near the axis, revolving so much slower than those most distant from it, would not be as clearly represented, but the problem has nothing to do with the actual distance made by the wire in space; the simple requisite being that every part of the outline shall reappear eight times per second. The period of persistence seems very short, yet the actual number of vibrations made by the visual organs during that time is so large as to excite the incredulity of those who have not fully investigated the subject. The most common case of persistence is the line of light which boys at play sometimes produce by rapidly rotating a firebrand. The same effect is seen in the flight of a rocket, and on a grander scale in the zig-zag fiery path of the lightning spark.

A white spot on a dark wheel, revolving at high speed, portrays a white ring, and spots of different colors will unite and give the same resultant hue, which would be made by mixing similarly colored paints. One of the most curious optical illusions is presented when radial lines on different revolving discs assume the form of curves.

Persistence of vision can be most readily illustrated by drawing the upper half of the human face or form on one side of a small card, and the lower half immediately underneath, but on the opposite side of the card, and then suspending it from the top by a thread, so that it will hang in a vertical line. After twisting the thread sufficiently to cause a rapid rotation of the card, it is left free to move, and when the two halves are each presented to the eye eight times per second, their images become combined on the retina, and form a complete picture. Various plans for producing the same effect will doubtless be suggested to the reader.

There is another class of visual impressions which are reproduced involuntarily when the eye is overtasked. The retina is generally so delicately constructed as to be sensitive to many hundred different tints, and it responds to the undulations causing them, so as to convey to the mind a distinct impression of each. When, however, the retina is exposed to the direct rays of a strong light—the sun, for instance—it is thrown into such violent internal agitation that a brilliant image of the object from which the light emanated will be visible for several minutes when the eyelids are closed, and will sometimes reappear in diversified colors, which are generally complimentary to those immediately preceding. A remarkable peculiarity in these phenomena is the reappearance of the latent image, which may even be recalled or reproduced by an act of the will, after the eye has received many other impressions. It is not improbable that the spectral apparitions, which were formerly said to haunt humanity in "the witching time of night," were the offspring of a disordered and over-excited retina; thus every impalpable shape, that rose as naturally as the remembrance of its original, when conjured by a diseased imagination, became to "the mind's eye" a terrible reality.

Mr. James A. Whitney read the following paper on

## *AGRICULTURAL ENGINEERING.*

One of the most interesting and characteristic results of modern industrial progress, is shown in the almost universal tendency to divide all arts and sciences of a utilitarian nature into distinct professions or specialities. To cluster around each of the branches thus created, the theoretic information and the practical skill which will best conduce to the special object sought, thereby enabling the wants of every business or occupation to be met by the acquirements of men trained and experienced in all its phases. Thus, for instance, the science of engineering first divided into civil and military, has in the course of time developed the other classes of mining and mechanical engineering; and although a proficiency in one class supposes some acquaintance with the others, yet each, so to speak, is independent of the rest, and has its own course of instruction, its own appropriate text-books, and its own recognized place among the systematized and progressive occupations of mankind. To take another illustration, the art of working in wood has shaped itself into the distinct occupations of the ship carpenter, the joiner, the patternmaker, and others that might be mentioned, each trade requiring its peculiar apprenticeship, and each explained, and shaped, and molded, by rules deduced from the careful study of all natural forces involved in carrying it into use or practice. From this aggregation, in separate channels of talent and information, of skill and experience, has resulted the steady and constantly increasing development of the various manufacturing and mechanical interests of the civilized world, a result which could only have been produced by systems that, training their practitioners for well defined professions, have kept them alike from neglecting knowledge necessary to be acquired, and from wasting time and effort in obtaining that which could serve them no direct and tangible purpose. Yet, it is a noteworthy fact, that while every other great department of human labor has been thus wrought into special parts, the oldest of them all, the one which statesmen and political economists have lauded for untold ages as at once the best and most useful, the one upon which the food and raiment of all civilized lands depends, has never yet been thus systematized, and exists to-day in what may almost be termed a chaotic state. That in this age, when machinery is found in every branch of farm operations, when it is sought to yoke the same power that drives the shafting of mill and factory to the plow and the seed-sower, when no project seems too visionary, and no theory too daring to those who would meet the wants of the tillers of the soil, there is no recognized science that can justly claim the name of agricultural engineering. That the appliances of the agriculturist are for the most part the study only of those whose professions have no necessary connection with the work of the farm, and whose technical education includes nothing of the thousand and one points of practical importance in every device or apparatus designed for the tillage of the ground. The writer is perfectly aware that in the old country, enough has been done in this direction to originate what is there commonly known by the term we have mentioned, and to constitute, if not a distinct branch of mechanical science, at least a separate division of manufacturing industry. Yet, if we scan closely the progress thus far made, even there we will find, that although considerable has been attempted and accomplished in drainage, the utilization of sewage and other matters related, more or less, both to agriculture and engineering, the head and front of the progress made in agricultural engineering, consists in the application of steam to the tillage of the soil, and hence a birds-eye view of the subject under consideration, will involve a somewhat extended prospect of the present condition and past progress of this department of terraculture.

That the attention of scientific mechanics should have been earlier directed to steam cultivation than to any other portion of the farming interest, may be easily accounted for. The stiff clay soils and dank mosses common in many parts of England, capable only of being imperfectly plowed with horses, and in many cases wholly defying all ordinary means of culture, could not but suggest inquiries as to the possibility of applying to the plow the motive power so valuable in the propulsion of other machinery, and consequently, we find that even before the condensing engine of Watt had revealed the gigantic capabilities of steam, daring innovations on established customs had proposed the culture of the soil by machines, in which it was designed to dispense with animal power altogether, and it may perhaps be interesting to consider some of these earlier attempts, not only because of their antiquity, and the inventive genius displayed iin ther design, but also for the reason that in a great degree they furnish the foundation principles of construction around and upon which the efforts of later projectors have gathered and crystalized, to such an extent, indeed, as to justify the proposition which we propose to consider at greater length hereafter, that whatever measure of success may have attended more recent steam plowing experiments, has resulted not from the application of new mechanical principles, but simply by greater skill in practical construction.

The sixth patent mentioned in the English records, was granted in January, 1618, to David Ramsey and William Wildgosse, and the invention is described in the quaint language of the period as "Newe, Apte, or compendious formes or kinde of engines or instruments and other profitable invencons, wayes and means for the good of our commonwealth, as well to ploughe grounde without horse or oxen, and to enrich and make better and more fertill as well barren peate, salte and seasande, as inlande and uplande grounde within our kingdomes of England and Ireland and our dominion of Wales." Sixteen years later, Ramsey alone received another patent, in which there is strong reason to believe the invention was intended not only for plowing the ground, but also for sowing the seed. What variety of engines were to be used, is not clear, but inasmuch as at this time the steam engine was in its infancy, we may presume that some of the now forgotten forms thereof were designed to be employed. As no specifications of these apparatus were filed, no definite knowledge of their construction and operation can be obtained, but the inference drawn from the patent last named, would lead us to conclude that a traveling carriage was used, for the reason that seed could not be sown by machinery, unless the latter was moved along the ground, and if this be true, the class of steam plows that have been most extensively tried in this country, may have had their prototypes in the dreams of projectors, two hundred and fifty years ago.

In 1770, Richard Lovell Edgeworth patented a portable railway, or artificial road, to move along with any carriage to which it might be applied. This invention is said to have occupied the inventor for forty years, and would appear, from the imperfect records, to have been similar to the endless track of the Boydell steam-plow of recent date. These obscure devices furnish the most important items in the history of steam culture previous to the year 1836, which may be assumed as the commencement of the modern era of steam tillage. In June of this year, Thomas Vaux patented a rotary harrow, in which curved teeth or tines were arranged on two axles, one in front of the other, and rotated in such manner as not only to pulverize the earth, but to clear each other, when in operation, of clods, couch-grass, etc.; and this may be taken as the representative of one class of steam tillers—the rotary diggers. Three years later, Alexander McRae brought forward a plan for cultivating land by steam power in British Guiana, where the land is flat and intersected by canals. Two punts, or shallow vessels, were placed in adjacent canals, or, in other words, one upon each side of the field; one punt carrying a steam engine, which gave motion to a winding drum, and the other fitted simply with a pulley. The plows were attached to a four-wheeled carriage, and a rope or chain attached at one end to the carriage was passed around the drum of the engine on one punt, and thence across the field and over the pulley on the second punt, and then back to the carriage, to which its remaining end was then attached, in such manner that the chain being worked alternately in opposite directions, the carriage, with its plows, would be drawn across the field, the position of the punts being of course changed as the width of the plowed land increased. This invention shows the principle of drawing the plows across the field by ropes, as in the class to which Fowler's plow belongs, and also shows another characteristic of this class in the fact that it was provided with two sets of plows capable of being raised alternately from the ground, and designed to enable the apparatus to work, when drawn in either direction, without turning. It should be mentioned, however, that in the year 1800, a drain plow was produced, with which the winding chain was employed; but in this case it was proposed to operate the chain by hand. We thus see that the essential characteristics or principles of operation involved in the three great classes of steam tillers. The traction engine drawing the plows, the rotary diggers and the plows actuated by chains, or their equivalents, extending across the field, were all known many years ago, and strengthens the opinion we have expressed, that whatever favorable results may have been obtained from modern experiments in steam culture, have sprung, not from the introduction of important new mechanical ideas, but from the greater skill and nicety of workmanship shown in building them.

Most prominent of the traction engine system was the plowing machine, furnished with the Boydell endless rails, a revival, or, at most, an application, as we have hinted, of the Edgeworth traveling road-way of a hundred years ago. The Boydell plow was for a time the subject of considerable laudation, but on extended trial was found incapable of competing with others, and its practical employment has been declared by high authority to be altogether out of the question. The system of locomotives traveling over the land was not given up, however, without much effort to obviate its manifest objections; but these efforts appear to have been directed mainly to the employment of rotary digging devices, the gang-plow method having apparently met with but little favor. As examples, we might mention Alger's rolling forker, in "which a set of rowels of large diameter, with curved tines or teeth, being set in motion by the onward progress of the implement, penetrate and lift up the soil, while a second and smaller set of rowels are employed to clear the teeth." This machine was claimed at the time to be very effective, but it will be noticed that, except in the relative size of the two sets of so-called rowels, it operates on substantially the same principle as the digger of Richard Vaux, which we have mentioned as patented in 1836. In Usher's machine, brought forward in 1849, the apparatus was propelled by a portable engine placed thereon, which also operated a rotary digging device, which was also designed to assist in the propulsion of the apparatus; a rather futile idea, inasmuch as all the force exerted by the digger to drive the machine was, of course, just so much subtracted from its digging power. Another and more curious example of this variety of tilling apparatus is found in the steam tiller of Chandos Wren Hoskyns, propounded in 1851, and in which it was designed to employ rotating disks toothed at their peripheries, so as to rasp the soil, and thus comminute the same. Notwithstanding the amount of energy and ingenuity employed in adapting the rotary plan to steam tilling machines, the system has fallen into desuetude, and at the present time the only practically successful steam-plowing mechanism in use, may be said to be that operated by hauling-chains or ropes, on McRae's plan of thirty years ago, the punts of McRae's system being substituted by movable engines and pulleys arranged and anchored at opposite sides of the field, either upon what is known as the direct or the roundabout system, most illustrations of this variety also including another feature of the same invention in the double sets of plows, capable of being used alternately as the machine is drawn in opposite directions. Fowler, whose steam plows may be taken as, upon the whole, the standard of success in this branch of engineering, has three distinct plans, all based, however, upon the use of a movable engine, and all too well and widely known to require particular description here.

Having thus briefly traced the salient features in the history of steam cultivating devices in England, we may turn to the consideration of their present effectiveness under their most favorable aspect, bearing in mind, however, that we have but glanced at the more prominent features of the subject, and that the amount of ingenuity developed in each of the classes we have mentioned, has been something enormous—not less than three hundred English patents on steam plows, steam grubbers and steam spades, having been granted previous to 1859. How many more have been produced by the agitation of the subject for the last nine years, the writer has not been able to ascertain.

In the pursuit of steam cultivation, two objects or results are sought, the one purely mechanical in its nature, that of pulverizing and disintegrating the soil in a superior manner; the other, purely financial, that of performing the work at a cost not exceeding that involved in the ordinary methods of tillage; and inasmuch as Fowler's machinery has been the most widely known and the most extensively and satisfactorily employed, there is, as we have just hinted, probably no better criterion by which we may judge of the degree in which either of these results have been obtained; and with reference to the first, that of the practical execution of work, it cannot be denied that very great success has been secured, inasmuch as land has been plowed and made arable by steam plowing, which in many cases it would have been impossible to have plowed to the same depth by horse-power.

The greater depth of furrow secured by the steam apparatus has contributed materially to the amelioration and increased fertility of the land, not only by the deeper pulverization of the soil, but by the increased facility given to the natural drainage of the same; but when we come to consider the other object sought, the problem assumes a darker shade, and there is strong reason, from a purely business point of view, to doubt the practical availability of this method of cultivation. In order to more fully understand this aspect of the case, it may be as well to consider in detail the cost of a plow of this kind, capable of plowing about eight acres in a day of ten hours, in what appears to have been a stiff clay soil. The whole apparatus, including its fourteen horse-power engine, cultivator, anchors, porters, and eight hundred feet of rope, cost one thousand pounds, or about five thousand dollars gold, and was kept in repair by a good engineer at an annual expense of five hundred dollars gold. In order to work the machine there was required an engineer, engine driver, plowman, two anchor men, three boys, and a cart, man and horse for carrying water and coal. We thus find that to plow eight acres of ground of the character indicated, necessitates the labor of six men, three boys and one horse; to which must be added the cost of coal, oil and other incidentals—about thirteen shillings sterling—which, at the rate of wages paid, would be equivalent to, at the very least, the cost of four men more; and further, there must be included in the estimate a due proportion of the interest upon the original cost of the machine, and of the annual expense for repairs. When we reflect that a stout team and single plowman can plow from three-fourths to an acre per day, even in a hard and compact soil, it will require but slight arithmetical powers to estimate the comparative economy of the old and new systems. More than this, when we bear in mind the technical and professional knowledge required in managing an instrument at once so complex and so dangerous as a steam engine, the liability to accident and derangement, to which all intricate mechanism is exposed in the open field, and the important though common-place skill necessitated in the management of a number of persons attending the same machine, it will be seen that the difficulties in the way of the financial success of steam cultivation are so numerous and varied, that such success cannot in any degree of fairness be claimed or conceded; and in support of this opinion we may cite the words of the President of the Royal Agricultural Society, that it is "a success which a very small amount of ignorance and inattention would convert into a failure." In other words, by far the most important branch of engineering, as applied to agriculture in England, under the most favorable circumstances, has produced nothing but a system of plowing by steam, which, by the slightest carelessness on the part of managers or operatives, will be sure to result in financial loss and failure, a result which we may remark is very different from what we should demand and expect from the application of science to industrial pursuits; for the true object of engineering is not merely to show that a mechanical problem may be solved, but to increase the capabilities of labor, and by lightening the toil, add to the prosperity and welfare of mankind.

Any statement relating to the subject in hand, would necessarily be incomplete, without some notice of what has been accomplished or attempted in this country; but such notice must be very brief, for the simple reason that the American experiments in steam culture may be said to have been thus far little more than a repetition of those in England with locomotive or traction engines, the system of draught adopted in the most successful English apparatus being to such an extent unsuited to the requirements of American farming, that as far as the writer has been able to ascertain, not a single trial thereof has been made here. One of the pioneer efforts to practically apply the system of plowing by steam in the United States, was made by Obed Hussey, of mowing machine celebrity, who at the cattle show of the State Agricultural Society of Maryland, held at Baltimore in 1855, exhibited an apparatus which "drew four large plows several times across the field, turning furrows from seven to fourteen inches deep." It was afterward attempted to use this plow on the prairies of Indiana, but much difficulty was found in making the plows work satisfactorily, and as a practical affair, appears to have achieved not even a temporary success. Fawkes' steam plow, tried before the executive committee of the Illinois State Agricultural Society in 1858, excited perhaps more attention than any other tested in this country, but in its practical results, appears to have amounted to nothing more than other traction engine plowing machines had done before it, and in fact, differed from the latter mainly in the employment of a bilge-shaped driving wheel or roller, which it is needless to say was a difference too slight to materially affect the working of the apparatus. In Saladie's steam digger, brought forward somewhat later, digging shares were arranged spirally upon a drum carried by a locomotive, and designed not only to dig the soil, but to act as paddles to assist the propulsion of the machine, which in its most essential features, was simply a revival of Usher's plan of some years before. The principle of operation embodied in some of the earlier English rotary cultivators, was also employed in an apparatus designed by an inventor named Hawkins, but we are not aware that it was ever practically tested. Several other steam cultivating devices might be enumerated as having attracted more or less attention within the last decade, but as none of them may justly be said to be either mechanically or financially a success, it is unnecessary to mention them, and we must necessarily come to the conclusion, that in this country, to an extent far greater even than in England, agricultural engineering, even in the only field to which the term has ever been extensively applied, is nothing more nor less than a nonenity; but before proceeding to consider the state of the subject thus brought to our notice, it may be apropos to speak briefly of the next important mechanical difficulties in the way of steam plowing with traction engines, namely, the loss of power incident to the sinking of the wheels in the soft ground which it is designed to break or disintegrate. We see no way of overcoming this in the use of rotary diggers, except by dispensing with the engine for purposes of draught, substituting horses for drawing the machine, and employing steam power to operate the digging mechanism; and we believe that steam culture is capable of being practically developed to advantage on the plan, notwithstanding that a cultivator built to operate on a similar principle, was tried in England some years ago with very poor results, possibly arising, we may infer from the description, from want of the care and skill required in the details of construction in mechanism of the kind of which we speak. With reference to the gang-plow system employed by Fawkes and others, we would simply make a suggestion, which, as far as we know, is original, but which we have had no opportunity of practically testing, that inasmuch as the bottom of the furrow is always comparatively solid, it would be well to so arrange the plows as to open a furrow in advance of the two lateral sets of wheels of the engine, so that the wheels could run wholly on the firm hard bottom of the furrows, thus obviating their sinking into the soil, and utilizing the hitherto spent force of the engine in a proportionate degree. With reference to the objection often brought against the mold-board plow, employed in the apparatus of which we are now speaking, that it exerts as much force in compressing the soil beneath as in pulverizing that above it, we consider it a piece of nonsense, and nothing could better show the slight extent to which the practical principles of agricultural engineering are understood, than that such a fallacy should be so extensively believed.

We have seen that the term "agricultural engineering," as far as used at all, has, for the most part, been restricted to the cultivation of the soil by steam, and that, in the field indicated, it has been productive of no really useful or paying progress. Yet, when we reflect how many other branches of agricultural labor have been made the subject of mechanical appliances, at the hands of independent projectors and manufacturers; how, under all the varied conditions of farming, there can scarcely be found a single department acknowledged to be perfect; and how, more than all, new and broad openings for improvements are being constantly developed by the growth of the farming interests of the country, who can doubt that engineering, as a science, should be systematized to meet the requirements of agriculture, and that to the tillage of the soil should be brought the assistance of a class of practitioners educated in those branches of civil and mechanical engineering most directly relating to or involved in providing machinery for farm operations, or in carrying out such operations themselves? We know that we may be met here by the statement that some departments of agricultural machinery, as, for instance, the reaper and mower, have been brought to a condition of comparative perfection without such assistance; yet, could we trace the history in such isolated classes, we would find that success had been attained at an expense absolutely astounding in the aggregate, compared to what would have been sufficient to secure the same end, if agricultural engineering, as a science, had existed, and that the knowledge evolved by the costly experience is, for the most part, monopolized by individuals or manufacturing concerns, instead of being diffused within the reach of subsequent projectors. No farmer could be induced to employ one of the "horse-killing" mowing machines of a few years ago, whose weight and unwieldiness might have been reduced at the outset, had their makers understood to an equal degree the nature of the work to be done, and the proper proportion of parts required to perform it, but which, as it was, were only brought into their present efficient shape by the unnumbered experiments of years of trial; and should a projector, inexperienced in their manufacture, devise an essentially new harvester to-day, he would find that the practical or mechanical knowledge required to properly proportion its parts and fit it for operation, could be found only in the workshops of rival manufacturers, and in a large majority of cases wholly beyond his reach, would it not be better for him, and better for the country, if he could apply at once to an engineer wholly conversant with the minutiæ of farm work? And why, in this age of progress, should the inventor of an agricultural machine be thrown helpless and unguided upon his own resources, when the projector of a steam engine, a ship, or a spinning machine, can find men at his hand fully qualified to fit and proportion his invention for use?

One of the greatest of the industrial demands of the Southern portion of our country is a practical machine for picking cotton—a machine which we believe will some day or other be brought into effective form—and which, had it been produced ten years ago, would in all probability so modified the industrial interests of that section, as to have abolished the existing cause of the feeling that culminated in civil war, and of which the germ may exist in plans now in existence. For instance, in 1859, if we remember rightly, a machine was patented, by which it was designed to draw the bolls from the plants by suction; and although the apparatus, as set forth by the inventor, would probably require more time to pick the cotton than would be required by hand, yet it is easy to conceive that a machine acting on this principle might be made to draw the cotton from the plant with very great rapidity; but how many engineers possess that combination of technical skill and knowledge of cotton culture, which would enable them to state the power required to detach the bolls, the consequent consumption of fuel, and the weight and proportions of the machinery required to carry the apparatus into practical operation? It may be mentioned as a matter of interest, that a more recent patentee proposes to pick cotton by reversing the principle of the process just mentioned; in other words, by blowing it from the plant; while others suggest the use of gathering claws or fingers, operated by suitable mechanism. The latter plan would appear to be inadmissible, inasmuch as the fingers would require to be guided by hand; but it appears reasonable to suppose that either of the others can be made available, inasmuch as the suction or blowing, as the case may be, capable of detaching the ripened bolls without interfering with those not ready for picking, and furthermore, would be uniformly applied at all parts of the height of the plants; yet, however plausible these theories may appear, a trained agricultural engineer might, perhaps, upset them by the simple suggestion, that the cotton, when detached, might be caught by the twigs and branches in such quantities as to render the use of the machine unprofitable; but we venture to believe that this did not occur to the inventors, and would not be suggested by the mechanicians employed to build the apparatus.

We have instanced this as one of those opportunities of future progress, in which the exercise of a high grade of engineering skill and agricultural knowledge may find extended action; but there are many others worthy of note.. It is only necessary to talk with a western farmer, to find that the time is looked for when machinery shall husk the ears from the standing corn; when a machine, drawn between the rows, shall strip the husked ears cleanly from the stalks, and convey them to the wagon-box without other assistance than a driver to manage the team. We believe that in a few years this may all be accomplished; but no one can tell how much time and effort will be lost in futile experiments; for, of those best qualfied in other respects to construct machinery, how many are aware of the conformation of the surface of a western cornfield; the power required to bring the stalks within the reach of the machine; the portion of the stem of the cob which may be broken with the greatest ease, and the hundred and one other points involved in the efficient working of such an apparatus?

We had intended to include in these remarks not only a brief consideration of the general application of machinery in the various subdivisions of farming, but also of the drainage of fields, the utilization of waste fertilizers and other products of the farm; the reclaiming of inundated lands; the irrigation of districts where the drought of summer necessitates the artificial supply of water to the growing crops, and other agricultural matters more or less akin to civil engineering; but the length to which this paper has already attained forbids, and we will conclude by expressing the belief that the necessities of agriculture demand a more thorough and distinct recognition of its claims upon the science of engineering—a recognition that can only be afforded by a class of engineers making a speciality of their profession in its relations with the tillage and amelioration of the soil; and although this may be secured only after the lapse of years, and be accomplished by halting and feeble steps at first, we trust that the time will at last arrive when there shall exist a profession worthy of the name of agricultural engineering; when farming shall be raised to the place that belongs to it among the sciences; when the first-born of earth's industrial interests shall claim its tribute alike of practical experience and technical knowledge, and the title of Master of Agriculture take its place with the rank of Master of Arts or Master of the Sciences.

At the conclusion of Mr. Whitney's paper, an animated discussion followed on the feasibility of plowing by steam, in which, however, no new plans were proposed. At a late hour the meeting adjourned for one week.

## March 12, 1868.

Professor S. D. TILLMAN in the chair

### *NEW HYDRAULIC APPARATUS.*

Dr. H. Cole exhibited a model of his method of raising water, designed to facilitate the flow of water to the upper floors of buildings. An equipoise is established between two columns of water, the height of which may be varied at pleasure by intermediate chambers, and the slightest pressure of the finger on the top of one column causes the water in the other to move. The principle applied is the same as that of the hydraulic press. In the debate which followed, it seemed the general opinion that, although the apparatus was an ingenious combination, there was some doubt as to its practicability, and as to its supplanting some more simple devices for accomplishing the same object.

Mr. A. H. Fleury read a paper, most of which is embraced in the following:

## GOLD—ITS HISTORY, NATURE, RELATIONSHIP, ETC.

What a history of joys and sorrows, of expectations and disappointments, of virtue and vice, of folly, passion, and crime, could many a small gold dollar, or ducat, relate, were it gifted with intelligence and speech! What curious hiding-places and scenes could many an old gold coin describe! However interesting and instructive as such a history of gold among men would be, it is not the one I propose to bring before you this evening; it is the history of gold in nature I contemplate to lay before you. We will trace the precious metal to its rocky hiding-places, and attempt to unravel some of the mystery that seems to enshroud it; we will then give a brief account of its physical and chemical properties, then review its peculiar relationship to other elementary substances, and finally state some of the most effective and successful processes for its extraction from the various ores.

All modern accounts agree in tracing the origin of gold to veins of quartzose and schistose character. Wherever gold is found, either in the sand of rivers, or in diluvial deposits, or in rocks, we ever find it enshrined, or, at least, in close proximity to silica, either as quartz, or as clay slate, or as another more complex siliceous combination. There are some exceptions, however but these are few in number.

Gold, in varying proportion, is found in most of the metallic sulphurets, arseniurets, and other similar compounds, either combined or free; but these are mostly embedded in quartzose veins, or disseminated in schistose rocks.

In order to understand more fully why gold is found in the sulphurets and other analogous combinations, and these again are enclosed in quartz veins, we must trace out the origin of quartz itself.

We have here several pieces of quartz; they all contain various metallic sulphurets, and some show traces of free gold, all of which are firmly embedded in the crystaline siliceous mass. How did the sulphurets and the gold get into the quartz, and what agency forced the quartz through the fissures of the rocks?

We all know that quartz is a product of aqueous and not igneous origin. We have ample proofs to that effect in the presence of volatile metals, such as antimony, arsenic, zinc, and others, also in the presence of water in geodes, and the close proximity to hydrated and carbonated minerals. The theory of the injection of qnartz as a glassy, highly-heated mass, by volcanic agency, has been superseded by the more sensible one of aqueous action.

The following thoughts I read last fall before the Association of Natural History in Boston, and as they received the attention of most of its scientific members, I will state them here in as few words as possible.

Reading the clear and beautiful explanation given by Prof. Fremy, in Paris, of the origin of the Gayser springs, and studying over his experiments with bisulphide of carbon on silica, alumina, etc., I could not help coming to the conclusion that nearly all quartz in nature owes its existence to the decomposition of sulphide of silicium by water.

To make this idea clear, I must digress a little, and state my own views on the condition of the interior of our globe.

Firstly, I believe in the existence of intense heat in the center of our globe,—a heat of such intensity, that all the elements are thereby kept in an incandescent gaseous condition.

Around the gaseous commingled matter I concieve, at first, a very liquid, melted mass, attached to a half solid, somewhat plastic crust, which, as it gets farther from the center, cools, and in its effort of expanding, breaks into fragments. The crust of our earth (probably forty miles in thickness), I conceive full of crevices and immense caverns, some of which, by passages of various dimensions, communicate with each other, and are ever changing, according to outward radiation of heat, condensation, and cooling of matter.

For the sake of illustration, I will call granite a primary rock, though I think that many rocks of by far greater age than granite exist below, which to our own surface rocks compare as our soil does to our own rocks.

When granite, or any other compound or simple silicate, is, while under presssure and a bright red heat, exposed to vapors of carbon and sulphur (both of which exist in abundance in the interior of our earth), the silica is decomposed:—the oxygen of the silica combines with the carbon and forms carbonic oxide and carbonic acid, while the sulphur seizes upon the silicium and forms sulphide of silicium, a white earthy mass, withstanding a great degree of heat.

As the interior crust of our earth is continually acted upon by cosmic disturbances, either by the gravitation of our own terrestrial substance, or by solar, lunar, or planetay influences, a gradual or sudden condensation, cooling, and breaking of the harder portion of the rocks takes place; water rushes into the crevices, and, reaching the sulphide of silicium and other sulphides, is instantly decomposed in its turn by the sulphide of silicium into oxygen and hydrogen. Sulphuretted hydrogen gas and a hydrate of silica are formed, both of which are soluble in water, and easily carried along by steam. The upper cavities, mostly filled with water impregnated with carbonic acid, which in itself is a great solvent and combining medium for metallic oxides, such as iron, copper, and others (all of which, no doubt, exist dissolved in this water), are suddenly broken into by these water vapors, carrying the hydrated silica and sulphuretted hydrogen with them, and the oxides hydrates, and other metallic solutions are broken up; the sulphur of the sulphuretted hydrogen seizes upon the metals, forms therewith sulphides, and the whole mass is forced upward, together with the liquid quartz. The hydrated silica carrying the heavier sulphuretted metals in the center, comes in contact with the cool atmosphere and the cold sides of the crevices, and a gelatinization and gradual crystalization takes place—the sulphurets crystalizing in the quartz.

I can reproduce, artificially, in a small way, what nature has done on a large gigantic scale. I can heat granite to a white heat, expose it to the vapors of bisulphide of carbon, then treat the sulphides resulting therefrom by steam, and carry the hydrate of silica and sulphuretted hydrogen into a basin containing carbonate of iron or other metallic solution, when the silica will be seen to gelatinize slowly, and the sulphurets of iron or copper crystalize in the silica.

Experiments which I have made in my own laboratory have led me to the following:

1. That gold exists in nature in two distinct allotropic conditions. In a crystaline state, withstanding the action of oxidizing agents under ordinary conditions, and in an amorphous, and oxidizable form. Plumbago and lampblack may illustrate this idea. The former is heavy, a good conductor of electricity, and has all the appearance of a metal, while the latter, the lampblack, is easily oxidized, is light, is a non-conductor of electricity, and is amorphous.

2. That in sulphurets the gold is mostly present in both modifications, and may sometimes be found in a chemically combined state.

I will here cite a curious experiment, which gives a fair illustration of what I say:

A quantity of finely pulverized sulphurets from a rich mine in Colorado, Montana, or California is, at first, carefully treated in a close vessel, with mercury vapors, then cooled and washed, the mercury separated, and the resulting quantity of gold weighed. The sulphurets, after having been thus treated, are then mixed with fine charcoal dust and plumbago, an equal quantity of each, placed into a carbon crucible, and this into a porcelain retort, which has a tube attached, through which the gases that escape during the heating of the crucible can be passed into a chlorine solution. When the crucible is slowly brought to a red heat, bisulphide of carbon issues forth, and at the same time the chlorine solution darkens; when tested with sulphate of iron or oxalic acid, a precipitate of gold is obtained. This volatilized gold is not absorbed by mercury. If the desulphurized remaining ore is then again treated with mercury vapor, as before, cooled and washed, a third quantity of gold is separated.

This, and a number of other observations have brought me to think that gold was, and still is, existing in nature in a chemically combined state, not only with sulphur, but also with silica as a silicate of the oxide of gold $Au\,O\,Si\,O^3$, as a silicide of gold $Au\,Si$, and, perhaps, in many other similar combinations. I ask you simply, my hearers, did we ever look for gold in a different state from the metallic? We speak of invisible gold, prepare in our laboratories solutions of gold, auric oxides, sulphides, and other combinations, and deny to nature, which we only imitate, the right and privilege to have used the same means, simply because our books say otherwise or nothing of it. Why can we not oxidize gold in its metallic state without first dissolving it? I think it is simply for the reason that it has to be brought to an atomic, amorphous state, and subdivision, before it is acted upon by oxygen or sulphur.

Rose-colored quartz is by miners considered quite a reliable indication that gold may be expected at greater depth. By smelting glass with purple of cassius, oxide of gold, auric acid, or even finely divided precipitated gold, we produce a splendid crimson glass, which, if a smaller quantity is used, has the color of rose. If rose-colored quartz is chemically decomposed with fluoride of calcium, gold can easily be detected in the result. I have witnessed many experiments, and made myself, while in Boston, a number of tests with various fluorides, such as cryolite, fluorspar, and the so-called Stevens flux, all giving me the evidence that the opinion expressed by Prof. Bischoff, in Bonn, the best authority we have in chemical geology, that gold, as well as platinum, may derive its origin from the decomposition of silicates, is well founded.

We will now take up the next point, and give a brief account of the

### PHYSICAL AND CHEMICAL PROPERTIES OF GOLD.

Pure gold is of a reddish yellow color, and possesses a high metallic luster. In the pulverulent state it is brown and dull, but acquires metallic luster by pressure. The specific gravity of melted gold is 18.2, of hammered gold, from 18.3 to 19.4. Finely divided gold precipitated by sulphate of iron was found to vary in density from 19.55 to 19.72, and when precipitated by oxalic acid, its density was 19.49. Its chemical equivalent of combination is 196.44, its formula Au., aurum; its alchemistic sign, ⊙, or Sol, the sun, the emblem of purity.

In a pure state, gold is softer than silver, and nearly as soft as lead, but its tenacity is so great that it may be drawn out into very fine wire. It is extremely malleable, and can be hammered out into leaves only $\frac{1}{370000}$ of an inch in thickness. The same amount of leaves (370,000) made of printing paper would reach nearly a hundred feet high. A single grain of gold may be extended over 57.75 square inches of surface, or drawn out into a wire five hundred feet long. Reamur, by rolling out a fine silver wire covered with gold, reduced the coating of gold to the twelve-millionth of an inch in thickness, and the surface appeared to be perfect when viewed under the microscope.

Gold does not directly combine with oxygen, and therefore suffers no change by exposure to air and moisture at any temperature, not even by being kept in a state of fusion in open vessels.

I intend, so soon as I shall have sufficient time, to institute a series of experiments for the purpose of ascertaining the influence of the metalloids in vapor form on precipitated gold under different degrees of heat, also how far electricity influences its chemical character and stability.

Gold, under ordinary circumstances, and in its metallic form, is not attacked by the mineral, or any of the simple acids, except by selenic acid, with the aid of heat. Iodine has only a weak action upon it, but bromine and chlorine attack it easily at ordinary temperatures, and it is dissolved by any substance that liberates chlorine. It is therefore dissolved by hydrochloric acid, if binoxide of manganese, chromic acid, etc., be added. The usual solvent is a mixture of one part of nitric and four parts of hydrochloric acids. The proper solvent for gold is nascent chlorine, which is eliminated by the mutual action of the mixed acids.

Gold is one of the most perfect conductors, both of heat and of electricity. It fuses at bright red heat, the temperature of which has been estimated at 2016 degrees F. It is, therefore, less fusible than either silver (1873 degrees F.) or copper (1996 degrees F). In fusion it exhibits a bluish green color. Gold contracts on cooling, and cannot advantageously be employed for castings. Native gold affords numerous well defined crystals belonging to the cubic system; and of these the greater number is affected by the faces of the regular octohedron.

Gold has a peculiar metallic luster, which, if once seen, can scarcely be mistaken. Its malleability and equally reflected light, when held at varying angles, distinguishes gold from pyrites and sulphurets.

The following are the chemical tests given by Muspratt:

*Sulphate of iron* gives, in acid solution, a brown precipitate. If very dilute solution, only a blue coloring.

*Protochloride of tin:* In dilute solutions a purple red coloring; when strong, an almost brown precipitate.

*Metallic zinc* precipitates metallic gold as a voluminous brown precipitate.

*Potassa in excess:* No precipitate; after some time a green coloring and slight precipitate.

*Ammonia:* Yellow precipitate of fulminate of gold.

*Carbonate of soda or potassa:* No precipitate in cold solutions, but when heated, voluminous precipitate, like oxide of iron.

*Bicarbonate of the same:* No precipitate.

*Carbonate of ammonia:* Behaves like ammonia, carbonic acid being evolved.

*Oxalic acid:* Dark, greenish black precipitate, more quickly produced by heat.

*Tartaric acid and tartrate of soda:* Dark precipitate when boiled.

*Sulphide of ammonium and sulphurretted hydrogen:* Dark brown or black precipitate.

The usual tests for silver are the following:

*Potassa:* Brown precipitate; becomes black on boiling.

*Carbonate of soda or potassa:* White precipitate, soluble in excess of ammonia.

*Carbonate of ammonia:* White precipitate, soluble in excess of the same.

*Phosphate of soda:* Yellow precipitate, soluble in ammonia.

*Oxalic acid:* In neutral solution a white precipitate.

*Sulphuretted hydrogen and sulphide of ammonium:* Black precipitate.

*Hydrochloric acid:* White, curdy precipitate, soluble in ammonia.

*Zinc, or copper:* Precipitate, white metallic silver.

*Sulphate of iron:* In neutral solutions white metallic silver.

We will now rapidly glance over the series of chemical combinations, which we have succeeded in preparing with gold and other elements by artificial means.

*Aurous oxide:* Au O. Formed by precipitating protochloride of gold with a cold, dilute solution of potassa. Blackish violet when moist, bluish violet when dry. This oxide is permanent at ordinary temperatures, but decomposes at two hundred and fifty degrees C.

*Purple oxide of gold* is formed, according to Berzelius, when a powerful electric current is passed through a thin gold wire. The gold burns with a green light, and is converted into vapor, which deposits itself on the adjacent surfaces in the form of gold purple. This purple oxide is formed even in air two hundred times rarified. The presence of other bodies favors the oxidation of gold at high temperatures by predisposing affinity—the oxide formed being generally red.

When gold leaf is triturated with various substances, and exposed to the blowpipe flame on a small cupel, the following results are obtained: With *potassium*, the alloy oxidizes quickly as it forms, and is converted into a black powder, which fuses into a violet glass with silica and borax. With *hydrate or nitrate of baryta*, the gold disappears, and colors the baryta red brown. With *hydrate of lime*, the lime acquires a reddish or bluish gray color. When gold leaf is placed in a crucible with hydrate of lime, in alternate layers, and ignited, the gold disappears and the lime acquires a flesh color.

With *silica containing potash*, red coloring, accompanied by disappearance of the gold. With *zinc*, gray powder, the gold disappearing. With *iron filings*, the gold disappears quickly, and yields a gray mass; and if this substance be ignited with fresh gold leaf, as long as the latter disappears, a red mass is obtained, still having the form of the filings, and very slightly soluble in dilute sulphuric acid, the solution not being attended with evolution of gas (*T. A. Buchner Rep.*, 27, 1). It is in this red form that gold enters into glass fluxes.

*Auric acid, or teroxide of gold:* $Au\ O^3$ produced by precipitating a hot aqueous solution of terchloride of gold, free from excess of hydrochloric acid, with a strong excess of potash. There are many other methods of preparing it. It is a brown black powder, having a conchoidal fracture. Decomposed by light, or at an incipient red heat, into metallic gold and oxygen gas; it gives up its oxygen to vegetable acids, and many other substances. When boiled with potash lye, it is resolved into protoxide of gold and aurate of potassa.

*Hydrated auric acid*, $Au\,O^3 + HO$: This is obtained by mixing a solution of terchloride of gold, not containing free acid, with a quantity of potash, only just sufficient to neutralize the hydrochloric acid, and repeatedly washing the reddish yellow precipitate, which does not appear till after the lapse of several hours. The hydrate, after drying in the air, which takes place but slowly, exhibits a chestnut brown color. When heated to one hundred degrees C., or when treated with potash solution, it gives up its water, and is converted, with diminution of volume, into the black oxide, part of which, however, is reduced to the metallic state. This hydrate is perfectly soluble in hydrochloric acid.

Identical with this appears the precipitate which Vanquelin obtained, by heating the acid gold solution with pure potash or carbonate of potassa. This precipitate, when recently formed, was of loose texture, and of reddish yellow color, resembling, when deprived of its moisture, dried blood. With acids it forms the salts of auric oxide, or auric salts, and with the alkalies and some of the earth's compounds, called aurates.

Gmelin describes another very interesting combination with oxygen. *Perauric acid:* $Au\,O^5$; but this seems to be a mixture of oxides.

*Gold and sulphur: Protosulphide of gold* $Au\,S$. A black-brown powder, exhibiting a deep yellow streak, is produced by passing sulphuretted hydrogen through a boiling solution of chloride of gold.

*Tersulphide of gold* $Au\,S^3$. By precipitating a solution of terchloride of gold with sulphuretted hydrogen, or an alkaline hydrosulphate at ordinary temperature, a black precipitate results. According to Levol (*N. Ann. Chim. Phys.*, 30, 355), the precipitate thus formed consists of $Au\,S^2$, which contains water, and does not give it up till heated to one hundred and forty degrees C. It is also prepared by fusing gold in excess with pentasulphide of potassium, and dissolving the fused mass in water, and precipitating by an acid. The sulphide of gold then falls down in deep yellow flakes, which turn brown on drying. (*Berzelius.*)

I will only quote a few more of the artificial gold combinations, which of late have grown to a formidable number.

*Protochloride of gold* Au C: Yellowish white, formed by heating terchloride of gold to the melting point of tin, in a porcelain basin. Hydrogen gas, passed for some time through a neutral solution of chloride of gold, gives a fine purple red color, without forming a precipitate.

*Terchloride of gold* $Au\ Cl^3$. Gold leaf heated in chlorine gas absorbs it without visible combustion. Gold leaves and finely divided gold, obtained by precipitation, dissolves in heated hydrochloric acid. Gold dissolves, even at ordinary temperatures, in chlorine water, in mixture of nitric acid with hydrochloric acid, sal ammoniac, and common salt, and in mixtures of hydrochloric acid with nitrates, or with chromic acid.

$$Au + N\ O^5 + 3\ H\ Cl = Au\ Cl^3 + 3\ H\ O + N\ O^2.$$

It is very interesting to study the action of the various metals and other elements, as well as compounds on the solutions of terchloride of gold. Some precipitate the gold as yellow metallic gold, some as a black powder, and some as the red oxide. In short, there is evidently a large field for research.

I extract the following curious item from Gmelin's Handbook of Chemistry:

"*Gold and silicium:* Finely divided metallic gold, chloride of gold, fulminating gold, the precipitate thrown down from solution of the chloride by potash, or by silicate of potassa, the purple of cassius, etc., fused at a continued gentle heat, with a glass containing oxide of lead, impart to it, according to circumstances, a yellow or purple red color. Among the various explanations which have been suggested for the red coloring which has been imparted by heat to colorless auriferous glass, the most probable, according to H. Rose (*Pogg* 72, 556), is that the colorless glass contains a silicate of aurous oxide, which requires a high temperature to produce it, and can bear that temperature without decomposition; but that when it is heated to a lower temperature, part of the aurous oxide separates out, and produces the color, and finally, at a stronger heat, the separate aurous oxide is reduced, and the glass thereby rendered liver-colored and opaque."

It would take us too long were we to review even the most important combinations of gold with other substances; enough, however, can be seen from this, that there must exist similar combinations in nature; we have only to look for them, and specially among the silicates, the combinations of gold with metalloids and easily volatile metals, such for instance as gold and arsenic, bismuth, antimony, all of which form alloys with it, and change the point of volatilization.

For instance, arsenide of gold, a gray brittle alloy, is easily fusible, and does not give up all its arsenic even when fused for two hours in an open crucible.

## SPONGE GOLD.

Dr. C. T. Jackson, of Boston, discovered the manufacture of sponge gold, capable of welding while cold, by adding to a concentrated solution of chloride of gold a small quantity of oxalic acid, and then a sufficient quantity of potash, or carbonate of potash, to dissolve nearly all the oxide of gold, and then adding a large quantity of crystalized oxalic acid, and boiling the solution. All the gold is thrown down as a spongy mass, which, on being washed, is quite pure, and when pressed or hammered, becomes quite solid. (*Am. Journal Science* (2) 6–187.)

The action of electricity on different solutions of gold is very interesting. Among other phenomena of less importance, I will here mention that electricity can be used for dissolving gold in salt water in presence of peroxides. The chloride of sodium is decomposed, and the chlorine siezes upon the gold and forms a soluble salt, while the sodium oxidizes and forms soda.

The various methods of working gold ores can be divided into three classes, the mechanical, the chemical, and the mixed, combining the use of both methods.

## EXTRACTION OF GOLD.

The mechanical method is certainly the simplest, and consists in crushing the ore to powder, by means of stamps or crushing-machines, and in extracting the gold by means of amalgamating the precious metal with quicksilver or mercury. The more perfect the crushing and pulverizing process, the better, of course, is also the result obtained by the amalgamation. The crushing of ore is mostly done by the well-known old-fashioned stamp-mills. Some use steam or compressed air stamps; some adopt Whelpley and Storer's centrifugal crusher and pulverizer, all of which seem to be improvements on the old stamp-mill, and certainly work well where they are in good hands and connected with machine shops and founderies. A new crusher (Wagner's patent) is now on exhibition in this city, and works as well as any other I have yet seen. The principal feature of this machine is the ingenious manner of crushing the ore by attrition; this is by rubbing the one piece of the stone with the other. I have seen four hundred pounds of hard quartzose Mexican silver ore pulverized in eighteen minutes' time to a powder so fine that most could pass through a No. 100 sieve. It weighs about four tons, and is very simple and compact in its construction.

The old amalgamating system of running the pulverized ore with water over amalgamated copper plates is now gradually giving way to more perfect, though more complicated methods. Some run the ore into variously constructed pans, where, with assistance of heated water, a more perfect mechanical mixture of the ore with the mercury is obtained. This is more especially the case since Professor Henry Wurts, of this city, has made the interesting discovery that the addition of a small portion of sodium metal to the mercury increases the affinity of the gold for the amalgam; in most cases a considerably increased yield of gold has thereby been obtained. The Freyburgh barrel, as well as Wykoff's process of boiling the ore with salt water and mercury, whereby some of the sulphurets are decomposed, have, when carefully worked, given good results. Another, the "Staats amalgamator," treats the pulverized ore in a closed and heated revolving iron boiler, with steam and mercury (in vapor form), whereby also very favorable results are obtained. I beg to mention here my own recently-invented gold extractor, whereby in twenty-four hours ten tons of tailings or pulverized ore can be worked by one man at a cost not exceeding fifty cents per ton. One of these machines (engine and boiler, six-horse power, not included) can be made for one thousand dollars. The cost of amalgamating by the most ordinary method is about one dollar per ton.

My gold extractor has one great advantage over others, and this is that no handling of plates nor separate distillation is required, the same all being done automatically. The retort is connected with the mercury-bath in such way that the amalgam can be run into the retort and the gold obtained without disturbing the operation by distillation in vacuum. A very efficient chemical agent assists in decomposing the sulphurets.

We will now take up another system of treating the gold ores—the chemical method. We will subdivide it into the wet and dry, or fire treatment. The wet method we will call that by which the gold is extracted from the ore in the form of an aqueous solution, the so-called chlorine process. As, however, this treatment requires mostly a previous roasting of the ore, we will give at first to this interesting topic some attention.

We have, in the first part of this paper, shown that when sulphurets in powder form are treated with mercury, the gold was very imperfectly amalgamated, and could not all be extracted, only a comparatively small amount of the precious metal uniting with the mercury; and that a perfect and careful roasting of the ore is required, as well as also a condensation of the resulting vapors.

I studied carefully the various processes in use, such as Keith's, Whelpley and Storer's, Dr. Hagan's, Crosby and Thompson's, Dr. Ott's, Ryason's and several others, all of which are said to give perfect satisfaction. We will only give to them a rapid glance without comments.

The furnaces of Messrs. Whelpley and Storer, in Boston, have been described in most of our mining journals; they certainly look as if they could do some good work when properly managed. The ore, finely pulverized in their centrifugal crushing and pulverizing machine, is blown, together with charcoal-powder. down a vertical shaft or tower, the gases condensed, and then treated for the different metals. Keith oxidizes the pulverized sulphurets by air in an upward or horizontal direction. Crosby and Thompson do the same in a revolving retort; they condense most of the volatile products. (I learned lately that they get from the condensed smoke as much gold as they extract from the roasted ore.)

A very neat arrangement for roasting has been patented, and is now being tested in Washington, D. C., by Dr. Adolph Ott, of this city. The sulphurets pass successively through three separate superposed furnaces, in which automatic stirrers keep the ore in motion, and cause it to fall from one oven into the other, receiving three successive treatments, by which the ore is fully decomposed. The lighter metals, zinc, antimony, arsenic and bismuth are condensed in separate chambers, and the sulphurous gases subjected to a spray before they are allowed to escape through the chimney. The desulphurized ore is then moistened by steam, and placed into a large tank, where it is treated with oxychlorine gas, which rapidly converts the present gold into a soluble salt, the terchloride of gold $Au\ Cl^3$ which is leached out afterwards, either by pressure or by a centrifugal machine. The solution is then treated with sulphate of iron, or other precipitant, and the pure gold taken from it as a dark brown powder. This is quite an improvement on Prof. Plattner's successful chlorination process, and shows that the originator understands what he is about. This process is also adapted for the treatment of silver ores.

Dr. Hagan's desulphurizing process with hydrogen gas and carbonic oxide and acid, produced by previous decomposition of steam by carbon, is, as I learn, worked quite successfully for two years past in both Grasse Valley, Nevada Co., California, and Plymouth Ledge, in the same State. The Eureka or Ryason process is also said to work well in the Mariposa State in California. In this process, I learn, the disintegration, desulphurization, and extraction of gold by amalgam are all produced by the action of heated steam and mercury vapor on the ore while in a closed vessel, and the tailings run over a peculiarly constructed shacking table, so as to concentrate all the amalgam.

We will now pass finally to another system, the smelting method. When a rich gold ore is heated in a reverberatory or other furnace, and an appropriate material as flux added, the ore melts with it to a liquid mass, in which the specifically heavy gold will collect, melt and sink to the bottom. Soda, lime, oxides of iron have been extensively used, and some to great advantage. By my experiments with the so-called Stevens flux, the residuum from the cryolite when worked for soda, I have been brought to the new idea that gold must exist in nature as a silicate of the oxide of gold chemically combined, for, by treating the same ore with other agents (fluxes that do not fully decompose silica), I could not obtain the same results.

This Stevens flux is superior to the natural fluorspar, because it contains free oxfluorine gas, which has been absorbed by lime in a similar way as chlorine is taken up by it in the bleaching powder, hence its greater efficiency.

The fluorine has such affinity for the silica that it leaves the calcium, drives off the oxygen, and combines with the silicium to form fluor silicium and fluosilicic acid. The calcium takes up the oxygen and forms lime.

I have lately seen some astonishing results produced by the use of this flux with Nova Scotia and Georgian ores.

Mr. H. G. Hubert, of this city, has recently patented a system of furnaces, in which he uses a mixture of flux and ore as continuous lining of the furnaces (either cupola or reverberatory) with an impervious carbon bottom. This system cannot fail to come into use when this peculiar method of smelting shall have been better known and appreciated.

Taking all points, the defects as well as advantages of the aforementioned processes, into consideration, I have followed an entirely distinct road to arrive at long desired results, the extraction of all the gold, with most advantageous utilization of the refuse.

By a series of new processes, recently secured by letters patent, I cannot only obtain a complete solution of the quartzose ores in water, but also a complete chemical decomposition of the silica itself, so as to eliminate all that gold that has hitherto been lost, because I believe that it exists in the quartz in chemical combination.

There are numerous other processes in existence, and I shall take pleasure in mentioning them in a future larger publication on this subject, after my return from an information trip to Europe.

After some discussion of this paper, the Association adjourned.

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## March 19, 1868.

Prof. S. D. TILLMAN in the chair.

The Chairman presented the following summary of scientific news:

### ANTIDOTE FOR EXTERNAL POISONING.

Cyanide of potassium (*potamarn*), extensively used in electro plating and other processes, sometimes produces painful ulcers on the hands of workmen who use it. A correspondent of the *Boston Journal of Chemistry* says, experience has taught him that the most effectual remedy in such cases is the proto-sulphate of iron (*fermasot*) in fine powder thoroughly mixed with raw linseed oil.

### THE VOLTAIC ARC.

In regard to the establishment of the voltaic arc, M. La Roux states that results similar to those given by induction currents may be obtained with the ordinary currents from voltaic piles. With a nitric acid battery of fifty elements, the current may be interrupted for about one-twenty-fifth of a second, and then leap from one carbon element to the other, although they may be one-twelfth of an inch apart.

### BLACK PAINT FOR PHOTOGRAPHIC USES.

Mr. F. M. Carter has published the following recipe for making a cheap and durable black paint for the inside of dark rooms, camera boxes, slides, &c.: First, dampen lampblack with alcohol, then mix it with sweet milk to a proper consistency, when it is ready for use. It dries almost instantaneously, and will not crack or rub off. The same process will apply when other coloring substances are substituted for lampblack.

### LUTE FOR THE LABORATORY.

Chemists experimenting with chlorine gas will find Sorel's oxychloride of zinc an excellent lute. It is made by mixing commercial zinc white with half its bulk of fine sand, adding a lye of chloride of zinc of 1.26 specific gravity, and rubbing the whole thoroughly together in a mortar. The mixture must be applied as soon as made, for it hardens very quickly. Any apparatus luted with this material will serve for at least three months.

### NEW YELLOW DYE.

Martius has obtained from the naphthaline of gas works, dinitronaphtyl, by treating a solution of muriate of naphtylamin and nitrate of potash with nitric acid. The new compound is a weak acid which is purified by crystalization. It is scarcely soluble in water, but more so in alcohol. Its salts are either orange or minium-red in color. The yellow principle serves for dyeing wool and printing carpets. It yields brilliant golden-yellow tints; not greenish ones like those from picric acid.

### ARTIFICIAL GEMS.

The base of these gems, as patented by the superintendent of the Royal Porcelain Works at Berlin, is a flux obtained by melting together six drachms of dry carbonate of soda, two drachms burnt borax, one drachm saltpeter, three drachms minium, and an ounce and a half of purest white sand. To imitate in color, but of course not in composition, the following minerals, add to the flux the ingredients named in connection with each gem:

*Sapphire.*—Two grains carbonate of cobalt.

*Opal.*—Ten grains oxyd of cobalt, fifteen grains oxyd of manganese, and from twenty to thirty grains protoxyd of iron.

*Amethyst.*—Four to five grains carbonate of peroxyd of manganese.

*Gold Topaz.*—Thirty grains oxyd of uranium.

*Smaragd.*—Twenty grains protoxyd of iron, ten grains carbonate of oxyd of copper.

*Beryl.*—Ten grains protoxyd of iron.

### FLUIDS IN CRYSTALS.

At a late meeting of the Manchester Literary and Philosophical Society, Mr. J. B. Dancer gave a history of the discovery of fluids in crystals, including Sir Humphrey Davy's chemical experiments with fluids and gases obtained from the cavities in quartz crystals: Sir David Brewster's discovery of the pressure in the diamond, ruby, emerald, amethyst, chrysoberyl, &c., of the existence of minute crystals in such cavities, and of the two remarkable fluids, colorless hydrocarbons, found in amethyst from Siberia and quartz from Quebec, named brewsterline and cryptoline; both are sometimes found in the same crystal, but are not miscible. Brewsterline is said to be thirty-two times more expansible than water. Mr. Dancer described numerous crystals from various parts of the globe examined by him, which contained fluids; the most noticeable being in fluorspar of Derbyshire, which burst at 186° F. temperature. He suggested the employment of the microscope in distinguishing spurious from real transparent gems. At the conclusion of his remarks, crystals containing fluids were exhibited under the microscope, and while under examination the temperature of each was elevated to show the expansion of the fluid within it.

### THE DRAGON TREE.

The giant specimen of the *dracœna draco*, growing at Orotova, in the island of Teneriffe, was destroyed in autumn last in a gale of wind. This tree was first brought into general notice by Humboldt, about sixty years ago, when he computed it to be six thousand years old.

### EFFECT OF FROST ON LARVÆ.

A paper addressed to the French Academy of Sciences by M. Reiset, contained a statement that the general belief held by farmers, viz: that a severe frost kills noxious insects and larvæ which grub in the earth, is a fallacy. Emile Blanchard, after complimenting Reiset for his researches, said the fact was well known to naturalists that larvæ feeding on roots remained near the surface of the soil during mild weather, and descended to greater depths as the cold became more intense, so as to always escape the effect of frost. Mr. Chevreul said that Reiset had done good service in ascertaining, by precise experiments, at what depths, according to temperature, larvæ would be found in the soil. While the thermometer stood at fifteen degrees C. below the freezing point, and the ground was covered with snow, the soil at a depth of fifty centimeters (nearly twenty inches) was not influenced by frost. After these experiments, Mr. Reiset had told agriculturists that they were utterly mistaken, if they trusted to frost for the preservation of their crops from insects, and that they must exert themselves if they wished to escape the impending scourge. Knowing that last autumn the white worm was still near the surface, he caused a field to be slightly plowed and harrowed; and two persons following the harrows gathered three hundred and forty-four kilogrammes of worms, at a cost of twelve francs per hectare (two and a half acres). This field produced an excellent crop, while that next to it, from which no worms were gathered, produced nothing.

### INFLUENCE OF LIGHT ON MICROSCOPICAL ORGANISMS.

Prof. F. Cohn has made interesting experiments with the mouthless genera of infusoria, which are provided with cilia, and those genera of microscopical plants which are possessed of an independent power of migration. He finds they all move in a definite direction, and that the immediate cause of movement is light. In colorless organisms light has no influence, and they appear to move in every possible direction. Experiments with euglena gave the following results: If a drop of water, equally filled with these green organisms, be placed upon a glass slide, it will be seen, before many minutes, that they will betake themselves to that portion of the drop which is turned toward the window, or even toward that part of the sky which is most lightened. They crowd around this side, which we may call the window side, and give the drop a green edge, while the rest of the drop is quite colorless, and free from euglenæ; and indeed they place themselves together, so that their heads lie parallel one to another, toward the light, and their bodies are directed perpendicularly to the edge of the window. They cannot remove themselves from this position, but gradually dry up as the water on this edge becomes evaporated. Conversely, if the drop be moved, so that that which was formerly the window side is now turned away from the window and directed toward the room, by which the former room-side forms the window-side, an instantaneous movement in the whole of the organism will be seen, for the purpose of turning themselves round. The foremost soon turn round and swim toward the window edge, and the back ones follow one after the other. In the course of two or three minutes they have all taken their new positions. This experiment when repeated gives the same result, whether the drop lies on a dark ground, or is lighted from beneath through a diaphragm.

Further researches proved that it is not the intensity but the direction of the rays of light, which governs the movements of microscopical organisms. From a great number of experiments, Prof. Cohn draws conclusions which may be thus abbreviated:

1. The direction of the movements of green organisms is determined by the direction of the rays of light which fall upon them. They are attracted rectilinearly by the source of light. Apparent exceptions to this rule are brought about simply by the form of the drop or mass of water containing them.

2. They exhibit a polar relation to light; the celia (which is called the head) and that part containing no chlorophyl is turned toward the light, and the green portion away from it.

3. All movements are accompanied by a rotation of their bodies around a longitudinal axis passing through the head and tail. While in the dark they can turn from right to left, or left to right, but under light they have a definite direction which is contrary, in euglenæ, to the hands of a watch, and the same as the rotation of the earth.

4. Experiments with colored glass show that only the more refrangible or actinic rays induce this direction. The organisms are more strongly attracted by the blue rays, while the red are the same as total darkness. If one-half of the field is lighted by blue, and the other by red, they will go to the blue side, even if it be turned away from the window edge. There are some exceptional forms which turn away from the source of light by a backward motion, and afterward return to it.

5. It appears probable that all these phenomena, as far as direction of movement is concerned, depend upon the chemical activity of these bodies. We can, in fact, imitate many of these movements by purely chemical processes, with the help of what may be called artificial euglena, viz: a fusiform fragment of chalk, having one-half covered with a resinous cement, which, when placed in diluted sulphuric acid, develops chemical action in its uncovered half, and by the backward impulse thus generated in the direction of the covered end, the chalk is made to rotate.

### ELECTROLOSIS OF TARTARIC ACID.

M. Bourgoin's Memoir, brought before the French Academy of Sciences, gives his researches on the action of the electric current; first, on neutral tartrate of potash; second, on a mixture of neutral tartrate and alkali; and third, on free tartaric acid. In the first case, as soon as the current passes, only a moderate disengagement of gas is produced at both electrodes, the negative becoming alkaline. At the positive electrode, carbonic acid, oxygen, carbonic oxyd are evolved, and a white precipitate is formed, which, by analysis, is found to be pure cream of tartar. There is, however, some tartaric acid destroyed by oxydation. The fundamental action is the same in the second case, yet the results are different. In addition to the gases mentioned, hydride of ethylene and acetylene are evolved from the positive electrode. In the third case, carbonic acid is largely predominant in the gases evolved, and acetic acid is formed at the positive electrode. After the experiment had been in progress for five days, the solution in the neighborhood of this electrode was found to contain a large proportion of acetic acid, which was separated as acetate of baryta.

## MAMMOTH GLASS PLATE.

A single plate of glass has just been imported from France, twenty feet long by sixteen feet eight inches wide. It is used not as a window, but to represent, under a strong light, a frozen lake in a theatrical scene, where the professional fairies have made a new sensation by displaying the "poetry of motion" on glistening ice. A natural inquiry is, how such brittle material as glass can be cast and annealed to this extent—why it should not fly in pieces under the unequal changes of temperature to which portions of it are nightly subjected? The glass is made of such thickness as to resist a very powerful blow; but the effect of unequal heating, which often cracks iron plates as well as glass, is not so great as might be supposed; the number of feet upon it at one time does not exceed a dozen, and they are not there long enough to produce any perceptible change in the temperature of the glass. There is a secret connected with the manufacture of large glass plates known only in certain factories in France. It is, comparatively speaking, an easy task to make plates of enormous size, but to produce them free from cloudy spots, or, in other words, perfectly transparent and homogeneous throughout, has required much time and many experiments. The surmounting of difficulties yet encountered in other countries where glass is still too brittle, is probably the result of expert manipulation, as well as the adddition of new ingredients.

[From The N. Y. Tribune.]

## ELECTRICAL PHENOMENA.

The sympathetic recurrence of polar lights and magnetic disturbances in the atmosphere and crust of the earth, taken in connection with the periodicity of sun-spots, has of late years awakened much interest among physicists. A remarkable display of spontaneous electricity, simultaneous with sudden changes in spots upon the surface of the sun, occurred during the early part of January of this year. The electrical phenomena was thus described in *The Rochester Union* of the 10th of January last:

"One of the most beautiful electrical phenomena imaginable was witnessed last evening in the office of the Atlantic and Pacific Telegraph line. Wire No. 1 of the line was down between this city and Syracuse. Suddenly it was discovered that neither wire would work. A continuous current of electricity was then observed to be passing over the wires through the several instruments, and this while the batteries were detached. The current seemed to be of the volume of a medium-sized pipe-stem, and it gave the several colors of the rainbow, beautiful to behold. With the key open, the current flowed in waves or undulations, and from the surcharged wire it would leap over the insulated portions of the key, and flow along the wires beyond. The same phenomenon was observed at Buffalo and Cleveland. The gas in the office here was lighted without difficulty by holding the end of the wire within an inch or two of the gas-burner. The current was intense enough to shock one holding the wires or instruments—indeed, one of the employés of the office had his fingers scorched by the current. With closed keys, the current was continuous, as before stated."

The same phenomenon was described by a Buffalo paper as follows:

"One of those electric phenomena which visit us but rarely, occurred yesterday, from 4:40 to 7 o'clock in the afternoon, on the lines of the Atlantic and Pacific Telegraph Company. The current on the wires was so intense that it was impossible to touch them, even with all the batteries thrown off. The current passed over the wires in waves, and it was necessary to throw the instruments out of circuit in order to prevent damage to them. In endeavoring to take the wires out of the 'switch-board,' one of the operators received a shock which nearly lifted him from his feet, and, dropping the wires, he ran off, snapping his fingers vigorously. After the wires were disconnected from the instruments, the operators, while waiting for the current to pass off, were highly amused by the fantastic streaks which would flash across the wires. At one time a continuous stream of fire passed off, which lasted from four to five seconds. The gas was readily lighted by applying the wire to the gas burner. Had the current been more steady, the wires could have been worked without the aid of batteries. On passing the hand over the covered wire in the office, the effect was similar to that occasioned by passing the hand over a cat's back, only more intense. At Lockport, the electricity passed off the wires, and set fire to the board to which they were attached. At different points along the line, as far as Albany, similar phenomena were witnessed. The magnets became so surcharged with electricity, that when the wires were disconnected the 'armature' remained drawn up to the 'coils' for full three-quarters of an hour."

The following letter, written by the manager of the Atlantic and Pacific Telegraph Company, at Rochester, on the above phenomenon, will doubtless be of interest to many:

"Rochester, *Feb.* 10, 1868.

"W. S. Gilman, Jr.—*Dear Sir:* Your letter of the 3d inst., asking for certain information in connection with the electrical phenomonon which exhibited itself upon our wires on the afternoon and evening of the 9th ult., has been handed to me to answer, and I am gratified to be able to give the desired information. The first time that I ever witnessed a phenomenon of this character was at Cleveland, Ohio, fourteen years ago this winter, while working a wire between that place and Buffalo. I have since that time witnessed about six similar displays, but never before one as brilliant or as powerful as the last, which can be accounted for from the fact that our wires are all galvanized. On the 9th ult., while I was transmitting a telegram to New York over our No. 1 wire, trouble came in, which was afterward located between Fulton and Syracuse; our wire being broken, and the western end hanging across No. 2, rested on the ground. At the same instant I noticed my relay surcharged with an unusual amount of magnetism. Upon opening my key (which we usually give the sixteenth of an inch play), discharges of electricity averaging as high as 300 pulsations a minute flew from one platina point to the other, and the nearer I placed these points the more rapid they occurred. I could not only count them by sight, but by the thumping noise which they produced by attracting the armature to the magnet. The fluid was passing from west to east through the key. In addition to this, there was a current about the size of a pin, flowing from the core of the helices to the soft piece of iron on the armature, which sounded very much like electricity produced by friction on a glass cylinder, when passing to a leyden jar. The phenomena commenced at 4:30 P. M., and continued incessantly until 7 P. M., and it is remarkable that all the phenomena which I have witnessed heretofore, occurred between the same hours, and lasted about the same length of time. Mr. P. H. Shaughness, at the present time chief operator of the southern wires in the Western Union office, New York, and myself, were in the Rochester office of the New York, Albany and Buffalo Telegraph Company at the time William H. Seward delivered his famous 'Irrepressible Conflict' speech, in this city, a few years since. We were both engaged at intervals, sending a synopsis of the speech to New York, while it was being delivered in Corinthian Hall. On that evening there was a magnificent display of aurora. At first there were waves parallel with the horizon, flashing one after another until they reached the zenith. This was succeeded by perpendicular flashes which gradually extended clear across the horizon. Finally these disappeared, and the whole sky was red until about 2:30 A. M. While we were transmitting the abovenamed speech, the aurora, at alternate intervals of half a minute, completely neutralized the current on the wires so that they appeared to be open. Finally, Mr. George E. Allen, at that time chief operator of the line, and stationed at Utica, suggested that we disconnect the batteries from the line, which was done. Then when a wave charged the wire, we would have to make several turns up with our adjuster, and gradually turn down, while we were sending, until the next wave came, the length of the interval being equal to the duration of the wave. You will observe that in one case the current was increased, and in the other entirely neutralized, but this may be accounted for in the following manner: In the recent phenomenon, there was but one battery, and that was at Buffalo, the one at Utica being cut off by the broken wire near Syracuse; while on the evening, and just before Mr. Seward's speech was transmitted, the line was intact, and all the batteries connected. I have always noticed the weather when these phenomena occurred. It was at each time very cold, with a strong northwest wind blowing, accompanied with fine snow, except in the last instance, when the wind was from the southeast, and the thermometer not quite to zero, with snow. I have answered your questions, though not specifically.

"Yours, respectfully,

"B. T. Blackall, *Manager A. & P. Tel. Co.*"

The recent phenomenon was also observed at Cleveland, in the office of the same line of telegraph. Foreign currents made it impossible to work one of their wires. At this point it was first noticed at 9 A. M., when the current grew so strong that the manager of the line "ordered the No. 1 wire opened to Painesville, thirty miles east." This did not help it in the least. "I judged," writes the operator, "that our wires were crossed with Western Union, and that we were getting the full strength of their one hundred cups of battery. One thing very strange was that the current pulsated, and the armature of the magnet, disconnected from the battery, and the wire open east, vibrated like a pendulum." An unusual exhibition of northern lights took place during the electrical display noted in the above letter from Rochester as having occurred several years since. No reports of such an exhibition during the recent phenomena have been received. At Rochester a snowstorm prevented any examination of the sky; but at Coburg and Toronto, in Canada—the former of these places being nearly on the magnetic meridian of Rochester—no aurora was seen.

From sketches of a group of sun-spots, observed between the 6th and 11th of January, and noticed in *The Tribune*, it appears that interesting changes took place in the group on the 9th inst. The observations on that day were made at 9 A. M., New York mean time, and 4 P. M. The change was the subject of remark at the time in an observatory in Brooklyn. One part of the group appeared to have performed a *retrograde rotation*, toward the central and largest spot, during the time elapsing between the hours above stated. The motion was very rapid, roughly estimated at about three hundred miles an hour, and this in a direction contrary to the direction of the sun's rotation. The large central spot had rotated in a similar direction, with a velocity much slower than the smaller spots, and yet by a very perceptible amount. The phenomena did not seem accounted for by the apparent change of place of the group by the sun's rotation, and consequent change in perspective. It does not seem improbable, therefore, that the recent phenomenon may have owed its origin directly to an electrical influence from these spots upon the crust of the earth, or to an electrical disturbance of the atmosphere brought about through these spots without the usual accompanying phenomenon of aurora borealis. If, as has been conjectured, the sun revolves a vast electrical current, the friction of its enormous surface between a positive and negative pole, would doubtless be sufficient to produce the light and heat given out by that fiery orb. It would not be difficult to believe the spots on its surface caused by special currents of electricity to and from the various large bodies of our system, and perhaps in part by the specially attractive nature of metallic scoræ floating upon the liquid surface below. Sun-spots are frequently seen with a core of intenser blackness than the surrounding dark portions of the *umbræ*, as they are called. This black core, known as the *nucleus*, if seen in space would very possibly be too bright to be regarded with impunity. Both nucleus and umbra are thought to appear black as an effect of contrast with the dazzling electric light of the solar photosphere. The question suggests itself, may not this dark nucleus indicate the solid portion of the spot, and the seat of disturbance in some of the electrical phenomena which are from time to time witnessed in our earth, and cannot be accounted for in other ways? The speculation posesses no little interest. F. L.

The Chair would add, that the description of the display of spontaneous electricity upon telegraphic lines, quoted by this correspondent, will excite very general interest. Admitting the connection of such displays with the northern aurora and with solar spots, it may be questioned whether his explanation of the phenomenon is correct. The undulatory theory of light, now generally accepted by scientists, assumes that the interstellar spaces are filled with a highly attenuated fluid (ether), which, by its undulatory motion, becomes the medium of light and heat; yet recent experiments seem to indicate that this ether, which doubtless also fills inter-atomic spaces, as well as the so-called vacuum produced by an air-pump or a mercurial column, is not in its ordinary state a medium of electricity. Electrical force may be generated on the surface of the sun, but it is not quite apparent how such force can be exerted at the distance of ninety-two or three million of miles. It may be said that gravitation acts at any conceivable distance; but that force is constant, while the one under consideration is variable; the one is inherent in all matter, while the other is only observed under certain conditions.

That terrestrial magnetism varies in intensity is shown by the declinations of the magnetic needle; that these variations are effected by the sun, is also quite generally conceded; but no satisfactory explanation of the phenomena has yet been given. M. Aimé attributed these effects to thermo-electric currents produced by the unequal heating of the earth in its diurnal rotation; but far the largest portion being covered by water, which is not susceptible to thermo-electricity, we find in this fact a sufficient objection to the theory. Faraday conceived the idea that magnetic variations were due to changes in the magnetic properties of oxygen. This gaseous element, he proved, was strongly magnetic when cold, but correspondingly less so when heated. To the calorific effect of the sun upon the atmosphere, therefore, he attributed magnetic perturbations. The prominent objection to this view is, that the magnetic movements are quite regular, while the heating effects of the sun are variable.

Father Secchi, on reducing the observations made at various observatories, and constructing curves representing the motions of the needle, arrives at the conclusion that the sun acts upon the magnetic needle as if it were itself a large magnet placed at a great distance from the earth, and having its poles, of the same name as those of the earth, turned to the same side of the heavens. Both the sun and earth, we may add, must be regarded as magnets. Minor disturbances in the declination of the needle have been ascribed, by M. Reslhuber, to changes in the humidity of the atmosphere. With regard to the aurora, De la Rive presents the following summary:

"1st. All observations concur in demonstrating that the aurora borealis is a phenomenon having its seat in the atmosphere, and which consists in the production of a luminous ring having for its center the magnetic pole, and of a greater or less diameter.

"2d. Experiment demonstrates that, on bringing about in rarified air a reunion of two electricities near the pole of a powerful magnet, a small luminous ring is produced similar to that which constitutes the aurora borealis, and animated by a similar movement of rotation.

"3d. The aurora borealis would be due, consequently, to electric discharges taking place in the polar regions, between the positive electricity of the atmosphere and the negative of the terrestrial globe.

"4th. The electric discharges taking place constantly, but with intensities variable, according to the state of the atmosphere, the aurora borealis should be a daily phenomenon, more or less intense; consequently, visible at greater or less distances, and only when nights are clear; which is perfectly in accordance with observation."

The electric origin of the aurora being conceded, it follows as a natural deduction from the statement of De la Rive that the electric disturbance may be such as to affect a telegraphic wire even when no aurora is visible. Other causes have been assigned for the apparently spontaneous generation of electricity on telegraphic wires. In this connection, we present the following article in the *Journal of the Telegraph*, from the pen of Charles E. Pomeroy, agent of the Western Union line at Great Salt Lake city, Utah:

### FRICTIONAL ELECTRICITY EXCITED BY THE AIR.

A curious electrical phenomenon occurred several times upon the Overland Telegraph line, of which the following brief description is given:

It has happened three or four times within three years, that a strong, steady northwest wind blew from Fort Laramie, Dakotah, to Omaha, Nebraska, a distance of six hundred miles. This current of wind arose during the forenoon, and increasing rapidly toward noon, attained its greatest velocity at 2 P. M., at which time a powerful current of electricity, excited by the friction of the air upon the wire, was observed to flow into the Omaha office, changing the circuit to so great an extent as to entirely suspend communication, and heating the relay magnet to a degree which rendered it necessary to cut it out from the circuit at the thumb screws.

The main battery being thrown out of the circuit, the key was opened, when a large and remarkably vivid spark, of an intensely brilliant purple hue, appeared at the platina points of the key. The point of a penknife blade, which was inserted in the spark, was instantly fused. The spark continued uninterruptedly for several minutes, when, it being feared that the platina points would be destroyed, the key was opened to one-quarter of an inch play, notwithstanding which the spark increased proportionably in size and brilliancy, and remained unbroken. A bit of charcoal placed between the points of the key was almost instantly decarbonized and reduced to ashes. A small lump of blue vitriol was then introduced into the spark, and was immediately ignited, exhibiting a bluish flame, but being reduced to ashes less quickly than the charcoal; a common lead pencil being interposed, was instantaneously ignited and rapidly burned through, with a flame of a reddish tint.

The extraneous current was observed to flow in waves of fifteen minutes duration, leaving the circuit entirely open at the expiration of each wave, and resuming its intensity after a lapse of a few seconds. These intervals were accounted for on the supposition that corresponding lulls of the wind occurred at some point along the line.

Toward dusk, after the intensity of the current had decreased considerably, it was deemed safe to replace the relay in circuit, which being done, the line worked unexceptionably well to Fort Laramie without the aid of a main battery at either end.

This phenomenon is quite different to that of the aurora borealis, as the latter is nearly always fitful and irregular in its manifestations, while the former affords a comparatively steady current, by which the line can be readily worked without change of adjustment during the continuance of the wave.

This example of frictional electricity induced by the wind flowing parallel with a long stretch of line has probably never been witnessed elsewhere with the same degree of intensity, as there is no other line on this continent of an equal length which traverses such a level, unbroken geographical surface, over which the wind could have a sweep so continuous and uninterrupted.

In relation to the item on "Artificial Gems," Dr. Vanderweyde remarked that imitations of diamonds are made of heavy flint glass; they are sometimes called "paste." Glass without lead will not work easily. The Alaska diamond and the California diamond are only the silicate of lead, with a slight trace of soda. Jewellers say that when this imitation is worn by a lady at a party, no one can tell the difference between it and the original diamond. One test for a diamond is by tasting it, when the genuine will feel very cold. Glass is a poor conductor of heat, and after a few minutes it loses its luster. By putting in chemicals, the colors can be easily imitated. Another way to examine the stones is to view them through a magifying glass, and if no air-bubbles can be seen, they are of the best quality, for in pure gems no imperfections are seen. Twenty years ago artificial diamonds could be easily detected, as they were whiter than the real gems, which have a peculiar dark transparency.

Mr. D. W. Bradley stated that cheap stones, such as are sold "by the peck," are pressed when hot into the desired pattern, and then cut or ground.

In relation to the item on "Black Paint," Dr. Vanderweyde remarked that he preferred a yellow color for the dark room for photographic purposes, as black makes the room too dark.

Dr. Bradley stated that sweet milk mixed with red ochre makes a good paint for country houses and barns.

## *NEW TYPE-WRITING MACHINE.*

Mr. John Pratt, of Alabama, exhibited his type-writing machine. It was intended to dispense with a great deal of hand-writing, and to have an apparatus which can be employed quickly and reliably, not only by business men, but also by all those who cannot employ the pen rapidly. With this machine he claimed a person could, without any practice, write about as fast as with the pen, that is, about thirty words a minute. The printing is done on carbonized paper, by simply striking a few keys, much like those of a piano-forte. With a knowledge of the arrangement of the keys, an operator can print with almost as much rapidity in the dark as by light. By an automatic movement, the paper, which hangs vertically, is moved at the completion of every line into a proper position for printing the next line. There are only fifteen keys for the whole alphabet. The machine can be made for five or six dollars. When constructed on a large scale, four or five copies can be taken at the same time. This was the first time this machine was exhibited in public.

## *LOW WATER DETECTOR FOR BOILERS.*

Brown's low water detector was next exhibited. It consists of a brass tube connected with a metallic bar, which does not expand as much by the application of the same amount of heat. These are inserted vertically into the boiler, and connected with a lever on the outside, which is moved by any difference of expansion between the bar and the tube. When the water is too low, steam enters the brass tube and expands it, which causes the lever to open a valve, the steam in escaping blows a whistle, and thus gives the alarm.

## *PARALLEL RULER.*

Prof. C. A. Joy exhibited an ingenious parallel ruler, recently brought from Paris by him. It was designed for drafting purposes, to lighten the labors of draftsmen in drawing section lines. This machine is specially adapted for engravers, as it makes very fine parallel lines, of great length.

## *OSCILLATING STEAM ENGINE.*

Mr. Francis Millward, of Cincinnati, exhibited a small oscillating pivot steam engine. The cylinder was four inches diameter, and the piston had four inches stroke. An improvement in the lap and lead of the valve, and its great compactness, weighing only one hundred and ninety-five pounds for a two-horse power, were its chief merits. The cylinder vibrated the same as a pendulum. A discussion on oscillating engines, and the vibrations of pendulums, followed, in which Messrs. Emory, Fisher, and Drs. Bradley, Vanderweyde and others took part. Adjourned.

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## March 26, 1868,

Prof. S. D. Tillman in the chair.

The Chairman presented the following summary of scientific news:

### CERIUM.

This metal has lately been separated, by Wöhler, from the double chloride of cerium and potassium, by means of sodium. Formerly it was prepared by subjecting pure protochloride of cerium to the action either of potassium or sodium. Cerium is found in comparatively rare minerals, and generally associated with the metals lanthanum and didymium. Cerium tarnishes in air at ordinary temperatures, and displaces hydrogen in boiling water. The pure metal is therefore valueless, except as a reagent. It forms numerous oxides and salts, none of which have as yet been much used in the arts. Cerium has a darker blue than lead, and is only about one-half as heavy.

### PRESERVATION OF WINE.

The discovery of Pasteur, of France, that wine heated to the temperature of 60 degrees C. (140 degrees Fah.), will neither turn, become diseased, nor deposit sediment, has been applied in practice at the Longworth Wine House, in Cincinnati, with decided success. Major Anderson, the present proprietor of that establishment, constructed a heating chamber capable of holding 2,000 bottles of wine. Some of the wine heated was afterward exposed to the sun for four weeks, and only became more clear; while other wine of the same kind, not heated by similar exposure, showed traces of sediment. Dry wine in casks can be heated to the same point, and thus indefinitely preserved. The process is said to act as a restorative where wines have degenerated.

### LIGHT FROM OXIDIZED METALS.

According to H. Baumhauer, when the clean surface of either potassium or sodium is exposed to the air, oxidation is sufficiently rapid to produce an evolution of light.

### THE NEW ANÆSTHETIC AGENT.

Bichloride of methylene (*ached*), first used for producing insensibility by Dr. Richardson, of England, has been tried with success by Dr. A. R. Strachan, of this city. It is said to produce none of the unpleasant sensations attendant upon the inhalation of chloroform or of ether (*echalemat*). The new anæsthetic compound contains one atom less of chlorine, and one atom more of hydrogen than chloroform (*arlid*), and may, therefore, be considered less dangerous than the latter, but neither of the three agents mentioned can be as safely administered as nitrous oxide gas (*genat*), which contains only elements found in common air.

### TANNIN.

Lowe has found that gallic acid in solution is converted into tannic acid under the oxidizing influence of nitrate of silver. The oxydation is more complete if a salt or gallic acid is employed. The transformation of tannin into gallic acid has never been satisfactorily accounted for. Some have attributed it to the action of the atmosphere, others to the preëxistence of a soluble ferment. M. Van Tieghem's Memoir to the French Academy of Sciences describes experiments which prove both views untenable. He takes the ground that tannin undergoes metamorphosis by the development of a species of fungus in the solution. The atmospheric gases alone effect no change, but the atmosphere carries to the solution spores which require oxygen for their germination. After the transformation the whole of the gallic acid indicated by theory is present, but the amount of glucose present is variable, from the fact that the vegetation assimulates a portion of it. If the plant is developed on the surface instead of the interior of the solution, the vegetation is much greater, and the amount of gallic acid much smaller. Nearly the whole is then converted into carbonic acid gas. To prove that the fungus, during growth, splits up the tannin, it is only necessary to place in the solution some of this microscopic plant known as Aspergillus niger, and carefully exclude the air.

### THE COLOR OF STARS.

Mr. John Browning of the Royal Astronomical Society states that colors of celestial bodies estimated by comparison with the ingenious chromatic scale of Admiral Smyth, in which each color is represented of four different degrees of intensity, will not possess any relative value unless taken in connection with the aperture of the telescope employed when the color was estimated. Experimenting in relation to this subject, he had noticed that the chocolate color of the so-called belts of Jupiter is much more perceptible with an object glass of six inches in diameter than with one twelve inches. A small cluster in Perseus appears of an indigo blue with eight and a half inches, Prussian blue with ten and a quarter inches, and royal blue with twelve and a half inches of aperture. Were due allowance made for this disturbing influence by variation of aperture, many discrepancies between colors attributed to double stars by different observers might probably be reconciled.

### THE LIGNITES OF THE WEST.

Mr. F. V. Hayden, U. S. Geologist, has published, by permission, in *The American Journal of Science and Arts*, an abstract from his forthcoming report of the United States Geological Survey of Nebraska, which contains observations made by him during the autumn of 1867, in regard to the lignite deposits of Colorado and Dakotah. The following statements will be read with interest by those who have raised the question concerning the supply of fuel for the Union Pacific railroad:

Mr. Hayden's examination of the geology of Nebraska having failed to develop any workable beds of coal in that State, his attention was directed to the great lignite deposits of the Laramie plains. He found the lignite to be of excellent quality, in beds from five to eleven feet thick, and he estimated the area occupied by this basin at five thousand square miles. Its most eastern limit is about ten miles east of Rock creek, a branch of the Medicine Bow river. Outcroppings have been seen all along Rock creek, Medicine Bow, on Rattlesnake Hills, on the North Platte, Muddy creek, all along Bitter creek, Ham's Fork, Echo Canon, and all along Weber river, nearly to Great Salt Lake, showing that one connected series of deposits covers this whole area. The lignite taken from the beds on Rock creek is from the outcroppings, yet it burns with a bright red flame, giving out a good degree of heat, leaving scarcely any ash, and is quite as desirable fuel for domestic purposes as any wood. Indeed, it might be called condensed dry wood. It is non-bituminous, exhibits just a trace of sulphuret of iron, which, decomposing, gives a rusty reddish appearance to the outcrops; and there are seams of jet, one to twelve inches in thickness, which looks much like cannel coal, and is thus termed by the miners. The Union Pacific railroad will pass directly through these great coal fields, and, as most of the freight will go westward for many years, the cars on their return can be loaded with this lignite, thus to be distributed through Nebraska at a cost much less than that of wood at the present time. There are also indications of an abundance of iron ore in the vicinity of these deposits, and the Union Pacific Railroad Company contemplate establishing rolling mills in the Laramie plains, at no distant period.

The next point visited was South Boulder creek, the Marshall mines, which are probably the most valuable in the West. They have been wrought for four or five years. An average of fifty tons daily are taken out and sold at Denver, varying in prices from twelve to fifteen dollars per ton. The beds at the foot of the mountain dip to such an extent as to expose the whole series, eleven in number, varying from three to thirteen feet in thickness, making from thirty to fifty feet, at least, of solid lignite. Another mine has been opened about twenty miles south of Cheyenne City, on Pole creek. The lignite here grows better in quality as it is wrought farther into the earth, and is sold readily at Cheyenne City for twenty-five dollars per ton. The summit of the hills near this bed of lignite is covered with loose oyster shells, and there must have been a thickness of four feet or more almost entirely composed of them. The species seems to be identical with the one found in a similar geological position in the lower lignite beds of the Upper Missouri, near Fort Clark, and at the mouth of the Judith river, and doubtless was an inhabitant of the brackish waters which must have existed about the dawn of the tertiary period in the West. These lignite beds are exposed in many localities all along the eastern base of the mountains. According to the explorations of Dr. J. L. le Conte, during the past season, these same lignite formations extend far southward into New Mexico, on both sides of the Rocky Mountains. It is probable that no true coal will ever be found west of longitude 96°, and it becomes, therefore, a most important question to ascertain the real value of these vast deposits of lignite for fuel and other economical purposes. Specimens from the Marshall mines were found to contain:

| | |
|---|---|
| Volatile matter, expelled at a red heat | 26.00 |
| Fixed carbon | 59.20 |
| The elements of water | 12.00 |
| Ash of a reddish color | 2.80 |
| Total | 100.00 |

The percentage of fixed carbon shows at a glance the superiority of the western lignite over those found in any other part of the world. In some portions of the lignite at these mines there is a considerable quantity of amber. Mr. Hayden spent two evenings burning this fuel in a furnace, and came to the conclusion that it would prove better than ordinary western bituminous coals, and rank next to anthracite for domestic purposes. Being non-bituminous, it will require a strong draft to burn well. It is as neat as anthracite, leaving no stain on the fingers. It produces no offensive gas or odor, and is thus superior in a sanitary point of view, and when brought into use will be a great favorite for culinary purposes. It contains no destructive elements, leaves very little ash, no clinkers, and produces no more erosive effects on stoves, grates or steam boilers, than dry wood. If exposed in the open air it is apt to crumble, but if protected it receives no special injury. The connection of the lignite deposits on the Upper Missouri has been traced uninterruptedly to the North Platte, about eighty miles above Fort Laramie. The geological age of these western lignites is undoubtedly tertiary. Prof. Lesquereux has furnished valuable notes as the result of his preliminary examination of the fossil plants in the lignite deposits, which confirm this view of their age. Mr. Hayden says all evidence seems to indicate that there are no valuable beds of lignite west of the Mississippi in formations older than the tertiary, and that all the lignite tertiary beds of the West are but fragments of one great basin, interrupted here and there by the upheaval of mountain chains, or concealed by the deposition of newer formations.

## INTERNAL HEAT OF THE EARTH.

An artesian boring near Geneva, Switzerland, to the depth of 742 feet, and at an elevation of 1,600 feet above the level of the sea, showed an increase in heat at the rate of one degree Fahrenheit for every fifty-five feet; while another at Mendorff, in Luxemburg, which penetrated to the depth of 2,394 feet, gave an increase of one degree Fahrenheit for every fifty-seven feet.

### UTILIZATION OF SEWAGE.

An experiment is now being made at Asnières, near Paris, on a field of about two and a half acres in extent, and situated about three hundred yards from the mouth of the great sewer sink. Two portable steam engines pump five hundred cubic meters of sewage water into a receptacle at one end of the field. A part of the liquid is applied directly to various crops, and the remainder is treated with chemical agents for its purification and conversion into valuable compounds. M. le Chatelier has expressed the opinion that the cultivated lands around Paris can never absorb a considerable portion of the sewage water, because, first, the land is divided into small allotments, which increase the cost of distribution; second, the principal arable lands lie on high plateaux sloping contrary to the direction of the streams, and great difficulty would be found in getting rid of the excess of water by drainage.

### COLORLESS DRYING OIL.

Mulder finds that by boiling linseed oil for two hours with three per cent of red lead, and after filtering, exposing it in shallow vessels to sun-light and a current of air, a good colorless drying oil is produced.

### BARYTA WHITE.

Barytes, if ever so white, will not make so permanent a white paint as sulphate of baryta prepared artificially. Kuhlmann & Wagner's process is as follows: The native sulphate is at first reduced to sulphide of barium by calcining, in iron crucibles, four parts, ground to a fine powder, with one part of powdered coal, and from five to eight per cent of coal tar. After the process has continued for several hours, the mixture is removed from the crucibles and recalcined in a closed furnace to prevent any oxidation. When cold it is treated with hydrochloric acid, the liquid being kept alkaline to prevent the admission of other metals, and from the chloride of barium thus obtained, by means of sulphuric acid, is precipitated the permanent white.

In relation to the last two items read by the Chairman, Dr. Feuchtwanger remarked that linseed oil when bleached, will not change its color from any action of itself; but when with white lead, the compound is changed in color by sulphuretted hydrogen.

Magnesia is now very extensively used to prevent the oil from fading.

Dr. Vanderweyde stated that white lead is the best paint for out-door work, and zinc-white for inside, as the former does not fade to a yellow, if placed in the sun-light and air. He painted a picture about twenty years ago; as an experiment he used white lead to paint the clouds, and zinc-white for the snow on the mountain, and the clouds are now a yellow as desired, while the snow on the mountain is very white.

Mr. J. K. Fisher said that a few hours exposure to the action of the sun and shade, will make a perceptible difference in an oil canvas. Bleaching the oil is of no account, if it will return to its natural color.

In relation to the item on preserving wine, Dr. Bradley remarked that sulphurous acid will preserve cider from becoming sour. When the cider has reached the proper conditions, and it is desired to keep it there, the cider is put into a clean barrel, and when about two-thirds full, the fumes of sulphur are let into the barrel. The sulphur seems not to affect the taste of the cider, but keeps it fresh for a year.

Dr. Vanderweyde stated that when a barrel of wine has reached a certain degree of flavor, the fumes of sulphur are admitted into the bottles in which the wine is to be placed, and it is thus kept, but if there is an excess of sulphur, the wine will taste of it. The sulphate of lime will do the same thing, but, the doctor humorously added, many people cannot stand this in their stomachs, as it is apt to form plaster of Paris.

The Chairman remarked that sulphurous acid and the alkaline sulphites will destroy minute organisms, which produce zymotic action.

Prof. Horsford, of Cambridge, was one of the first, if not the first, to use sulphites for arresting fermentation and further change in cider.

## *NEW WOOD SCREWS.*

Mr. T. D. Stetson exhibited Pratt's patent wood screw, made with three threads, which admits of its being driven in to the wood with a hammer. They were used on the Harlem road, for fastening the rails, with much success.

## *SAFETY VALVES.*

Mr. Charles E. Emory, of the Novelty Iron Works, placed on the blackboard a formula with the following explanation:

Area of safety valve opening in square inches per square foot of heating surface in boiler, $\frac{1}{13.5\ (p \div 3)}$ in which p. equals pressure in pounds above the atmosphere. This formula gives results corresponding with those obtained by experiment for differences of pressure, varying from one pound to one hundred pounds per square inch. It is not strictly correct when the difference in pressure approaches nearly to zero. The formula gives the area required to maintain the steam at a given pressure with fires burning freely, but it should be remembered that a safety valve does not open sufficiently to give its full area without considerable increase of pressure. The area of the valve should, therefore, be much larger than that of the opening calculated, as above shown.

This formula also gives the proper size of the steam pipes connecting several boilers set in a "nest." The difference in pressure in the several boilers should never exceed one-fourth of a pound at the greatest; putting p—¼ in the above will give the smallest area of steam connecting pipe consistent with safety, and it would be better, when possible, to make them fifty per cent larger than this. The limited size of steam connections has been the cause of many so-called "mysterious explosions" in a nest of boilers having but one check-valve in the common feed-pipe.

## *GEOMETRY IN NATURE AND ART.*

Mr. T. P. Pemberton read a paper with this title, of which the following is a sketch: After speaking of the beautiful in nature, the lecturer proceeded to describe the geometrical figures therein displayed, and cited the forms of the planets and of their orbits. Of the human figure he said: The whole body displays wonderful mechanism and provision. The skull, as the casket that preserves the brain, is spherical, or a hollow sphere. It is light and of the strongest form—capable of bearing a great amount of pressure, and sustaining a superincumbent weight. The eye is elliptical; the nose is traingular; the neck is cylindrical; the heart is a cone; the tapering fingers are conical, and the bones themselves are hollow cylinders, whilst the whole body in outline shows the most graceful and beautiful curves.

The proportions of the human figure are strictly mathematical. The whole figure is six times the length of the foot. Whether the form be slender or plump, this rule holds good. Any deviation from it is a departure from the highest beauty of proportion The

Greeks made all their statues according to this rule. The face, from the highest point of the forehead where the hair begins, to the end of the chin, is one-tenth of the whole stature. The hand from the wrist to the end of the middle finger, is the same. From the top of the chest to the highest point of the forehead, is a seventh. If the length of the face from the roots of the hair to the chin, be divided into three equal parts, the first division determines where the eyebrows meet, and the second the place of the nostrils. The navel is the central point of the human body, and if a man should lie on his back with his arms extended, the periphery of the circle which might be described around him, with the navel for its center, would touch the extremities of his hands and feet. The height from the feet to the top of the head is the same as the distance from one extremity to the other when the arms are extended. These are the general measures of the species. The lecturer then spoke of geometrical forms and solids in trees, flowers, plants, fruits and vegetables.

Common beholders, he said, see these things constantly without observing them, and yet there is not a leaf nor a blade of grass which does not present a treasure of geometrical beauty; for we have leaves that are round, circular, cylindrical, oval, ovate, oblong, triangular, leaves that have five angles, and so forth. The seeds of flowers have the same resemblance to geometrical solids. Among fruits we have the apple, the peach, the pear, the plum, the grape, the nut, and many others of a spherical or conical form. In a carrot we find the cone, which cut transversly, shows concentric rings and circles. The tranverse sections of trees present similar rings—and the whole trunk is full of cylindrical pores for the conduction of sap. The forms of trees are conical and cylindrical; the branches and twigs taper off in a conical manner for evident reasons. Again, in animals and their products, we remark the display of geometrical provision, accuracy and beauty. The ovate form of eggs; the spider's web; the heads of fishes; the cycloidal flight of the eagle when pursuing his prey; the zig-zag lines made by the hare when chased by enemies; the graceful outline of the greyhound and of many other animals; in short, from the largest elephant to the most diminutive animalculæ, we trace geometrical figures and forms.

The hexagonal cell of the honey-bee has always been a subject of wonder and of interest. In every regular hexagon the distance from its center to any one of its angles, is exactly equal to any one of its sides. This is the crowning beauty of the regular hexagon, and it is this peculiarity which renders it so admirably adapted to the architectural instinct of the bee, and other insects, which construct hexagonal cells. In common with the equilateral triangle and the square, the regular hexagon can also be united, side to side, to others similar and equal—a property not possessed by any other regular polygon of a greater number of sides. It is well known to mathematicians that the regular hexagon affords greater capacity and strength, in proportion to the quantity of material, than either the triangle or the square.

In mineralogy we find cubical and spherical crystals, prisms, and rhombs; such as are seen on Iceland spar. On examining snowflakes beneath a miscroscope, they are found to consist of regular and symmetrical crystals, having a great diversity of form. Here again the hexagonal figure is the most prominent, as the majority of a number of flakes show six points or sides

The lecturer next proceeded to consider the geometrical principles of architecture. The various styles of architecture which have prevailed in different countries, are really exponents of the social development of the people where those styles have prevailed. In Egypt, where the people were serfs, and the religious ideas predominated over all others, the style of architecture was devised to embody the idea of the vast, the infinite, the enduring. And to embody these ideas, no style of architecture has yet been devised which equals the Egyptian. Its striking peculiarity is the oblique line—neither vertical nor horizontal—but oblique to the vertical. And this, though a simple element, when combined with massive parts and sacred symbols, gives an idea of almost eternal endurance and power. The style of architecture which has been principally studied for sacred edifices, is the Gothic. Here the leading ideas are to embody in symbols the doctrines of Christianity, and by attracting the eye of the beholder from the lower parts of the building to the higher, to raise his thoughts from the things of earth to the mysteries of heaven. He looks upon the foundation, and has his eye carried forward by some molding, or line developed in the material of the structure, until, on the outside, it is carried up to some pinnacle, or a tower or spire; the leading lines all tend upward. The ornaments are all designed according to the unerring laws of geometry; so that Gothic tracery is symbolic of the unerring government of Providence. The circle symbolizes eternity—having neither beginning nor end. The trifoliated leaves and tricuside tracery are also symbolic. While the upward tendency of all the main lines of construction, are symbolic of the other great doctrine of Christianity—the resurrection. The leading characteristic of the Grecian style is the horizontal line—the beam supported by columns.

Moldings are varied in both Grecian and Roman architecture. Those in the former are generally irregular in their curves, and are elliptical or parabolic. Whereas, those on Roman architecture are arcs of a circle.

Turning to mechanics, we find geometry at every point and in every direction. The draftsman regards it as his especial science. He is a regular dealer in lines, angles, and circles, and measures them out in good measure, pressed down and shaken together. His language becomes geometrical, his fingers move geometrically, and he is, or should be, a geometrical thinker.. Enter a machine-shop, and we find the artisan obtaining plane surfaces by the planer, the chisel and the file; curved surfaces by the lathe and the milling machine; circles and cylinders by the drill and borer. He can point out octagonal brass boxes for journals; hexagonal nuts for tightening up work; cylindrical pulleys; conical plugs; ball and socket joints; levels for finding an horizontal line, and plumbs for perpendicular ones. His very chisels are pyramids; the ends of his levers move in arcs of a circle, and all his work assumes geometrical figure and form. Adjourned.

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## April 2, 1868.

Professor S. D. Tillman in the chair.

The Chairman gave, as usual, a summary of scientific progress. The first item related to the carbonization of wood, from which it appears that too high temperature generates tar and gaseous products, and diminishes in a corresponding degree the more useful accessories. The experiments of Gillot show that wood, heated in an oven to two hundred and sixteen degrees centigrade, yields about two-thirds its weight of charcoal, and from seven to eight per cent of acetic acid. A German improvement on the process of refining sugar was alluded to, which consists in bringing the saccharine juice—after having been clarified by lime and carbonic acid, in the usual way—to the boiling temperature, and precipitating it with caustic baryta. The precipitate, suspended in water, is thus decomposed by carbonic acid.

An interesting explanation was given regarding the formation of nitrous gas during the fermentation of beet juice, which is a great annoyance to manufacturers. Various opinions are entertained regarding the cause of this formation; it is prevented by the use of sulphuric acid. An improved method of making pyrogallic from gallic acid was explained. Prof. Vanderweyde remarked that the subject was of considerable importance to photographers, who used large quantities of pyrogallic acid in developing pictures.

An interesting triumph in synthetical chemistry was next referred to. By simple additions, carbonic acid was converted to oxalic acid in combinations. Oxalate of soda had been made by Dr. Dreschsel, by subjecting sodium to a current of carbonic acid gas, and then of common air. The interesting experiments of Reiset were described, by which he showed that the carburetted hydrogen exhaled by calves and sheep was the result of incomplete combustion of vegetable food.

The subject which elicited the most interesting debate was the vitiation of air by stoves. The Chairman said some unwarrantable conclusions had been drawn from the experiments of Deville and Froost, proving that hydrogen, carbonic oxide, and carbonic acid gases can permeate and pass through cast iron. An epidemic in Savoy had actually been ascribed, by some foreign journals, to the passage of gases through cast iron heaters. It was, however, quite probable that such stoves were used in small and badly ventilated rooms. In this country, many stoves for burning petroleum and common gas were now in use, which discharged the gaseous products of combustion directly into the room, and unless such room was well ventilated, pernicious effects must follow. Of course, the same ojection could be raised to an excessive use of gas burners. The latest improvement is to place rows of burners near the ceiling in churches, theatres and public buildings, so that the gaseous products, while still hot, will pass rapidly up into the ventilating shaft.

Dr. Rowell made some interesting comments on heating by means of stoves as compared with the old fashioned fire-place, and illustrated on the blackboard some of Tyndall's experiments on the radiation of heat.

## *UNIVERSOLOGY.*

A paper was then read by Mr. Stephen Pearl Andrews, upon a new science under the name of "Universology," which had received his attention, with that of others, for the past five years. The gentleman first spoke of the embarrassment he felt regarding the proper method of presenting his subject, as a generalization would perhaps only open him to the charge of entertaining speculative opinions; while on the other hand he could not be expected to give an exposition of the science in the space of one evening, as the claims of universology were of unparalleled extent and importance. He stated that there was a work upon the subject in type, which would comprise some eight hundred pages, explanatory of the science; he should, therefore, simply rely for first impressions by reading statements contributed to this book by those who have had opportunity to know of the nature of the science, in preference to his own affirmation of its value. The immensity of the field, the necessity for lucidity, and the novel character of the scope of investigation, together with many other things, made the problem of presentation one of extreme difficulty. The speaker then remarked that it is obvious on reflection, that there must be a science of the universe, as such, distinguished from the special sciences of the parts, or of the spheres, or domains of the universe; and yet the very idea is one which is hardly entertained with any clearness of conception in the scientific world.

After some further introductory remarks, the gentleman read a paper contributed by Mr. Clancy upon the subject of universology, in which the writer says:

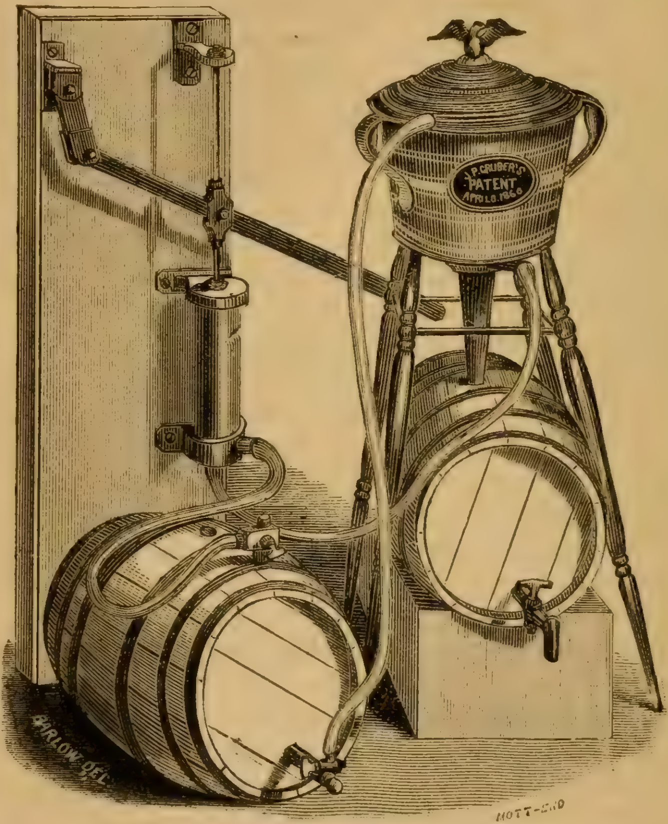
"The basis of universology is not in the accumulation and digestion of phenomena or facts *in themselves*, but it is to be found in the *law of comparison* between them. It will be readily inferred, then, that for the establishment and demonstration of the science, only the smallest possible modicum of fact is necessary; as the exhaustive analysis of the relations between any two objects, two facts, or two phenomena, will be the statement of the whole science in its fundamental, abstract and first-applied aspect. As in algebra, $x$ might represent a known or unknown quantity, and the whole solution take place with equal exactitude and precision; so, under the application of universological law, all questions are resolvable with equal facility, whether they relate to the more obvious and external domains of matter, or to the abstract and less appreciable realms of pure philosophy and metaphysics.

"The mind is the great spiritual sun. The laws of the mind are the universal sunlight which illumines all things, and makes them clear, analogical with the material sun; the radiations from this spiritual center are cast upon all things in the universe, bathing them in a glory, a beauty, a claritude so much greater than those of the external sun as the spiritual is higher in rank than the material. Nothing can be truly known except as the light of this ineffably brilliant orb is shed upon it; and all things knowable in the universe partake of the nature of the mind which knows, in like manner, as all things visible in the material universe are penetrated and permeated with the principle of external light. It is in these subjective laws of the mind, then, that we are to seek the ultimate explanation of all phenomena external to it, as in the reflex fact of the earth's motion was found the solution of the complex astronomical phenomena which before perplexed and deceived us.

"All philosophy has indeed aimed, in a sense, at this result, but the methods of speculative philosophy are too vague to satisfy the demands of the scientific world, and in the sense of a science, properly so called, the idea of anything universal has been almost entirely wanting. The scientific men are specialists. Their labors are as if a colony of learned ants were to have undertaken the investigation of the human body. One section of the little community devotes itself to the exhaustive examination of a finger nail, another to that of a lobe of the ear, another to that of the hair of the beard, and others to the investigation of all the various parts and organs and systems, segregated and regarded singly; but they have been so busy in these special and minute examinations, that it never occurred to any one of them to guess even, or, in any event, to give due consideration to the fact, that all of these various subjects are the parts and constituents of a man; and that, therefore, the first thing to know, logically speaking, in order to know anything rightly, of these particular subjects, is the general design and exact outlay of the man himself."

A member of the Association objected to consuming the time on speculative questions.

The Chairman remarked that the Association had in this instance departed from its usual practice. Mr. Andrews having expressed regret that he could not get a hearing in this city for the purpose of presenting his new views on science, he was promptly invited on to the free platform of the Polytechnic, with the understanding that his new views should be subjected to criticism. The speaker has certainly presented a pleasing view of what ought to be done for science, although many will doubt the practicability of the scheme; however, nothing has yet been presented in such form as to warrant



GRUBER'S FILTERING APPARATUS.

a further discussion of the subject at this meeting. When Mr. Andrews has accomplished his great task, and given to the world his system in print, a discussion here on the soundness of each new proposition advanced, would doubtless be productive of some good.

## *FILTERING APPARATUS.*

Mr. John P. Gruber exhibited his filtering apparatus, and gave a practical demonstration of its operation.

The annexed engraving represents air-pumps, in connection with a rectifying or filtering apparatus. In it is seen an air-pump fastened to a support, a barrel supposed to contain liquid of any description, a stand on which rests the filtering apparatus, and another barrel to receive the liquid after being filtered. The filtering apparatus consists of a metal cup or receiver, at the bottom of which is placed, inside, a fine tin strainer, and on this is placed felt, filtering paper or other material. At the bottom of the cup is a funnel, which admits of the whole apparatus being placed in a circlar opening, as the bung-hole of a barrel. It is kept tight by having the conical part of the funnel covered with rubber. The filtering process is as follows: The air-pump, working both ways, forces the air when downward strokes are given, and exhausts the air when upward stroke are taken. The hose connections between the barrels are for exhausting or forcing the air, and conveying the liquid from one vessel to another. The air is exhausted from the receiver, and a vacuum is formed, at the same moment air is forced into the barrel containing the liquid, and conseqently, with a pressure on the surface of the liquid in one barrel, and a vacuum in the receiver, the fluid flows from one vessel to the other, leaving all impurities and muddy ingredients in the rectifier. The hose-pipe from the side of the air-pump conducts the forced air to the barrel containing the liquid to be filtered. The pipe attached to the faucet conveys the liquid to the receiver, leaving behind all impurities during the passage through the rectifier.

The inventor applies a similar apparatus to glass jars and bottles, and being portable, it is useful to assayers, chemists and druggists. The process of filtering is by this arrangement greatly expedited, and in the case of purifying volatile liquids, this is a matter of some moment, as there is little loss by evaporation. After some favorable criticism of this machine, the Association adjourned.

## April 9, 1868.

Prof. S. D. TILLMAN in the chair.

The Chairman opened the meeting with the following:

### PURE HYBRIDIZATION.

J. Anderson Henry, Esq., in a paper read at the Botanical Society of Edinburgh, on crossing distinct species of plants, stated the rules and means used by him to insure success, the purport of which is contained in the following:

1. It is of vital importance to have the separate plants intended for the parents in the cross, even though both were hardy, brought under glass, in order to heighten the temperature and protect the plants against wind and insects. In the height of summer, however, pollen may be taken from an outside plant to cross with an inside one, and *vice versa.*

2. It is not enough merely to emasculate the seed-bearing flower. Every petal should be taken off, for it attracts insects, which seem to be guided more by their optics than any sense of smell. Emasculation should be performed long before the expansion of the bloom, because, in many plants, fertilization often takes place in the unopened flower. In some cases a gauze bag should be put over it, to protect the mutilated bloom from the most troublesome of insects, the bumble-bee, which, in his unwieldy flight, may come across it by pure accident.

3. Do not be in a hurry to effect a cross; wait till the stigma is found to be fully developed. This is indicated in many plants by a glutinous exudation on the summit, in others by the feathery expansion, and recurvature of its separate divisions.

4. Next obtain properly ripened pollen grains from the male plant. This is done by carefully watching when the anthers burst open, otherwise the insects may be before you. So active are they on such favorite food as the pollen of the *rebus* tribe (which includes the blackberry and raspberry), that it may be found necessary to incase the opening bloom in muslin bags. Do not use, as is generally recommended, the camel-hair pencil, for if applied often and indiscriminately, it may convey with the foreign, some insidious grains of native pollen, which, however few, are pre-potent, and wholly neutralize the former. Take, where it can be obtained and afforded, the entire bloom of the intended male, and give the slightest brush with all its anthers over one or all of the stigmas of the intended female. Both long and short anthers may be used,

and where the anthers are few, as in the *diandria*, *triandria*, &c., small pincers may be employed, or a bit of wire so twisted to form that implement, to carry in the pocket, is by far the handiest.

5. In some cases it is difficult to procure and preserve pollen. In diœcious plants, like the *aucuba*, it may be essential to store the pollen until the female plant, which is generally eaten, comes to flower. Many hold that pollen cannot be preserved in a vital condition for more than one or two, or perhaps three weeks. Wichura of Germany, in his recent work on Hybridization, holds it as "a fact of great importance that the pollen of willows retains its potency for some time. In some cases pollen ten days old was efficient, while vitality was still further prolonged by steeping it in a solution of honey. Pollen of *salix-salesiaca* (willowworts) eight days old seemed almost as potent as ever; in twenty-eight days the traces of vitality wery very slight, while that of *salix-cinerea* had become weak in sixteen days." On the other hand, he (Mr. Henry), had carried in his pocket the pollen of *rhododendron*, and of the Japanese forms of the genus *lilium*, again and again from six weeks to two months and upward, and still found it potent. Having, in 1866, got the new and beautiful *clematis-jackmanii* to flower, on the 4th of July he gathered its anthers, and stored them in a simple pill-box placed in a cabinet drawer, and on the 5th of June, 1867, having carefully emasculated a flower of *clematis-candida*, he crossed it with the pollen then eleven months old, and from this cross he had gathered and sown, last autumn, eight well developed seeds. Both parents were hybrids, with a large infusion of alien blood in them, so that in this case the vitality was put to the severest test. The result is noticed here to suggest the propriety of storing, and, if needful, of importing pollen, which, if wrapped up in silk paper, or even inclosed in a letter, might reach Scotland still potent, by the overland route from India, or, after two or three months' voyage, from all parts of North and South America. Let friends and collectors in distant countries be instructed as to this, and we may soon have an improved progeny of the rarest things, even before such novelties from which they are derived have been obtained from their own seeds.

6. Another matter of much consequence in crossing distant species is the times and seasons for effecting the cross; yet not one most experienced in the art, from Darwin downward, have touched upon this point. Such times occur, often few and far between, when there is less of sun than of that form of latent heat which is

frequently presented before thunder, from the air being more than ordinarily charged with electricity; or it may occur in the spring, during the presence of ozone, which seems to promote the germination of long sown seed.

The cross having been performed, the next anxiety will naturally be to find out whether it has taken. Almost all experimenters have noticed that soon—say from six to ten days—an alteration is observed on the stigma and style. On finding the viscous matter dried up, and the style beginning to shrivel, it would be natural to conclude that all is right, and that the fertilizing pollen has now passed down into the ovary, and in some cases this conclusion may be right; but these appearances are deceptive, especially if the style maintain an erect position. The various instances of failure noted by Wichura are as follows: *a.* The organs submitted to hybridization soon wither, but do not in all cases soon fall off. *b.* The ovaries swell and ripen, but do *not* contain a trace of seed. *c.* The ovaries may seem filled, having in some instances the small protuberant swelling outside, as if seeds were within, and yet no seed be there. *d.* Seeds are present, but small, languid and incapable of germination. *e.* Seeds apparently perfectly developed, but do not germinate. *f.* Seeds germinate, but the young plants are weak, and wither in a short time, dying off oftentimes after developing the seed leaves. Wichura further says: "When both parents belong to the same species, we cannot tell what part the male and female parent take, respectively, in the formation of the progeny. But dissimilar factors are united in hybrids, and an intermediate form is the consequence. The products which arise from a reciprocal crossing in plants, unlike those which are formed in animals, are pefectly alike. It is of no consequence which is the male and which the female parent. It is, therefore, a mathematical necessity that the pollen cells must have just the same part in the act of generation as the ovules." To the absolute correctness of these dogmas the lecturer demurred, and proceeded to describe various experiments made by him in crossing, which furnished exceptions to the rule of reciprocity, and where such reciprocity does hold, of the exact similarity of the progeny.

In experiments illustrating his view of sympathy and antipathy, the lecturer had found instances so inexplicable that he could only concur with Darwin, who, in his paper on the existence of two forms in the genus *linum*, after summing up the good gained by the inevitable crossing of dimorphic flowers, concludes from these and numerous other analagous facts, that some unknown law is here dimly indicated to us. The remarks of Mr. Henry, on crossing with long stamens, contain a suggestion interesting to those desiring to hasten the flowering condition of plants, or to make them flower more freely, which is, to cross violently, *i. e.*, where the allies are not too near akin, particularly in the case of mongrels; for nature, ere she gives up, ever makes a violent effort to reproduce. By so doing, the plant will remain longer in bloom, because most mongrels, especially those among herbaceous or soft-wooded plants, to which these remarks apply, are impotent to produce seed, or nearly so, and in such cases the blooms remain longer upon the plant.

*Lastly*, as to fruits, the lecturer entertained the belief that we are on the eve of a revolution—that by judicious and persevering crossing, we may not only transfer the delicious aroma of one to another, and communicate hardier and more abundant bearing habits to the hybrid progeny; but further, especially in stone fruits, such as peaches, plums, apricots, &c., we may, in addition to these advantages, increase the size of the fruits and diminish the size of the stones, and among vines get rid or greatly diminish the number of seeds. And all this would result from that law of nature by which she not merely strains her effort to reproduce (to which, however, she assigns a limit), but extends it when these have failed, to make provision for her creatures' wants.

In conclusion, the lecturer said that while his aim had been to achieve something useful and practical, rather to test the theories which Mr. Darwin and others—especially the Continental savans—have been so engrossed with, he could not refrain from alluding to the results and conclusions which some of them have come to on prosecuting a series of crossing operations, tending to show that such crosses do and must eventuate in sterility. M. Naudin seems, like Wichura, to have limited his experiments chiefly to herbaceous or soft-wooded plants; among such, especially among calceorlarias, the speaker has found himself brought to the terminus of a bitter and hopeless sterility. He remembered one instance where he had reached a perfect monster for size in that tribe, but, except in that particular, it had no desirable property. Determined, however, to improve it by crossing, he found, on trial, he could make nothing of it, and on examination he discovered that its stigma was a hollow tube, and its antlers were hard masses, containing not a particle of pollen. Man may run into such mistakes, but he cannot thence conclude that unviolated nature does so. Yet the speaker had sometimes found among hybrid seedlings a vigor superior, in that respect, to either parent. May not such often occur in nature, and as a naturally selected parent becomes the progenitor of a hardier and more vigorous race (which having in it, according to Darwin's views, a tendency to diverge), may it not culminate, in the long lapse of time, into a distinct species, and even annihilate the weaker one which gave it being? So that, in nature's crossing, may not fertility and vigor take the place of sterility and weakness, into which she so generally dwindles when modified by man's device?

## NEW PROCESS FOR PRESERVING WOOD.

Dr. Feuchtwanger read a short paper on various plans for preserving wood, and introduced Mr. Sigismund Beer to the meeting, who explained his new process for seasoning and preserving wood, and exhibited various specimens prepared by him. He first removes the albumen by submitting the wood to boiling water or steam, and then immersing it in a boiling solution of borax (the biborate of soda) in water; or the wood may, in the first instance, be treated with the borax solution. This removes all substances injuriously affecting the wood fiber. The wood thus treated, becomes harder, impregnable to water, vermin proof, unaffected by the dryness or moisture of the atmosphere, and is almost incombustible.

The subject was discussed by Prof. Vanderweyde, Messrs. Fisher, Stetson, Blanchard and Emory, after which John A. Parker, Esq., of New York, read the following paper:

## POLAR MAGNETISM.

With the consent of the Society, I propose this evening to read a paper which I have prepared, on the subject of polar magnetism—the attraction of the needle to the pole—the variations of the compass, and the phenomena observable as incident to the same.

The subject stretches over a vast area of natural truth, and therefore on an occasion like the present I must necessarily be very brief on each particular point. I do not propose to examine, criticise, or discuss any of the written theories on the subject, but to limit myself to my own personal observations and reflections, and to draw conclusions only from such phenomena as are manifest to our vision and sense, irrespective of all previous theories and speculations in regard to them. The subject has not only a vast scientific importance, but also a great commercial value, and it is in this latter connection chiefly that, in the first instance, I have been led to consider it.

Some knowledge of polar attraction is necessary to the study of astronomy; it is of national importance, inasmuch as the direction of the needle is oftentimes the arbiter of the lines and boundaries of our national domain, as it is also of our private estates; we rely upon it when, in traversing the continent, we plunge into the depths of the forest, and it is our only safe guide over a trackless ocean, through darkness and tempest, to the haven we seek. Tens of thousands of lives, and hundreds of millions of property throughout the world, are every hour dependent on it for safety; any inquiry therefore into its causes, and the laws which govern it, is invested with an interest second to no other; and, notwithstanding this, it may safely be said that, in comparsion with the whole that may be known, very little is at present positively known concerning it.

The existence of polar magnetism was first revealed to us by the discovery of the compass. There is some doubt as to the exact time of that discovery, but it is supposed to have been first put to practical use by the early navigators in their commerce on the Mediterranean sea. At that time, and long afterward, the needle was supposed to tend always toward a fixed point in the north; and therefore, when Columbus undertook his voyage of discovery, he was greatly suprised and not a little perplexed to find that, as he sailed westward, the needle gradually changed its direction; and his crew became so much alarmed by it, that all the steadiness of mind which that great navigator possessed was necessary sufficiently to calm their fears to prevent an open mutiny, and thus defeat his enterprise. In later times, by the observations of later voyagers, explained by charts, together with improved instruments for observation, and the means invented for determining the variation at any point, navigation has been made quite safe and certain to the careful and skillful navigator. But, so far as I am informed, the cause of these variations of the compass, and the laws which govern them, are wholly unknown to science.

I shall not detain you with a detail of the course of reasoning by which I have, in my own judgment, arrived at a full conclusion in this matter, but state broadly, and at once, what that conclusion is, and then explain some of the evidences on which it rests.

The cause, then, of the variations of the compass, which some have supposed to proceed from the oscillations of the earth, is, in my judgment, the revolution of the magnetic pole around the North pole.

By the magnetic pole we mean that point on the earth's surface within the arctic circle to which the needle points. By the North pole we mean, of course, the polar axle of the earth on which she turns in her diurnal revolution. And by the variations of the compass, we mean the divergence of the needle's point east or west, from the true north point, with its variableness at different times and in different places.

The revolution of the magnetic pole occurs gradually, through a long period of time, and, according to the best data which I can obtain, is completed only once in about six hundred and forty years. The time may be found to be somewhat longer or shorter, when settled by accurate observation.

The exact position of the magnetic pole has never been accurately known. It is known, however, to be at present situated on the North American continent, in a high latitude, and considerably west of the longitude of New York. This was made manifest by the observations of Captain Ross in his polar expedition. He placed the magnetic pole in latitude about 70 deg. 30 min. north, and longitude 96 deg. west from Greenwich. It has changed considerably since that time, and is at present both farther north and farther west than he placed it.*

The variation of the compass from the true north point at London or Greenwich is at present westerly. At New York it is still westerly, in a less degree, and at the islands in the Pacific Ocean it is easterly. Now, if the accurate variation at each of these points be taken (all local attractions being absent), and lines in the direction of the needle be produced northerly, they will meet at a point not far from 76 deg. north latitude, and 118 deg. west longitude from Greenwich. And that point, wherever they do meet, may safely be affirmed to be the present position of the North magnetic pole. It is not necessary for our present purpose that we should fix the exact point, nor are the means at hand to do it if needed—it must be done by careful and repeated observations at the same time on different and widely separated meridians, so as to exclude all possibility of error.

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* That Captain Ross did not quite reach the pole, is, I think, self-evident; because, if the situation of the pole had been in 70 deg. 30 min. north, and longitude 96 deg. west, it would have given a greater variation at London than existed at that time. But that his was the nearest approximation to the truth ever before known, is nevertheless quite certain. Almost at the same period of time, Humboldt placed it in his estimation in latitude 79 deg. north, and longitude 27 deg. west from Greenwich. This was certainly very far from the truth, as the observations of Capt. Ross, and all other authentic facts, conclusively show. For myself, I am unable to perceive on what basis of known truths Humboldt could have grounded his opinion.

The only point necessary for us to determine for our present purpose is, to show that which has already been shown, viz: that the magnetic pole is situated at a considerable distance from the North pole, and that being proved, we must now look for the evidence that it revolves about the North pole, which we will proceed to do.

In the year 1658, as shown by the records at Greenwich, the needle pointed due north from that position.[*] It is, then, certain, that in 1658 the magnetic pole was situated on the meridian of Greenwich, and between Greenwich and the North pole, or, coinciding with the North pole, or in a line beyond it, at 180 deg. west. No other supposition is possible. From 1658 the needle began to have a westerly variation at Greenwich, which continued to increase till the year 1818, a period of one hundred and sixty years, when it had obtained its greatest variation, Now, on the supposition of the revolution of the magnetic pole, it is evident that it would attain its greatest variation when it had passed over 90 deg. in the circle in which it revolves, and that in its progress of revolution the variation would then become less. Accordingly we find that in the year 1818 the westerly variation at Greenwich began to grow less, and from that time to the present has continued to decrease, which is in accordance with the necessity of the case in the supposed revolution.

From 1818 to 1868 are fifty years, in which time, supposing the period of one hundred and sixty years to have been the exact time in which the magnetic pole, by its revolution, passed over ninety degrees of longitude in the circle in which it revolves, in fifty years it would pass over twenty-eight degrees more, which would place it at this time in longitude 118 deg. west, where it is found to be, as nearly as can be determined.[†]

Coming now to the longitude of New York, although we have no record here going back to 1658, yet we know the fact that the westerly variation is increasing at New York, while it is decreasing at London or Greenwich, and this also is a necessity of the case in the supposed revolution; and if the hypothesis of revolution be true, and the period from 1658 to 1818, when it passed from zero to its greatest westerly variation at Greenwich, be perfectly accurate, then it will continue to decrease at Greenwich till the year 1978, when the needle will again point due north at Greenwich; while at New York (longitude 74 deg. west) the westerly variation will continue to increase, and will not attain to its greatest point till the year 1950. And corroborative of all this, supporting the hypothesis of revolution, it is known, that about the year 1790 the needle pointed due north from New York, as it should do, while to-day it has a westerly variation of nearly eight degrees, which again is in perfect accordance with, and indeed an absolute necessity in, the supposed revolution. The period from 1658 to 1790 is one hundred and thirty two years, being the *pro rata* time necessary to pass over seventy-four degrees of longitude; and here it will be apparent that in 1790, when the needle pointed due north at New York, the magnetic pole was then situated on the meridian of New York, and it is now 44 deg. west of it; thus showing the progress of revolution.

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[*] Brand's Dictionary of Science, article "Magnetism."

[†] In placing the pole at 118 deg. west, I give it the same ratio of progress which it appears to have had for one hundred and sixty years, viz: from 1658 to 1818. But if we consult the present variation as observed at New York, it would appear to be not quite so far west, or at about 116 deg. west.

Going still farther west to the islands in the Pacific ocean, we find there, that the variation is easterly and growing less, still fully supporting the hypothesis of revolution.

I will mention but one other fact in proof of my position. Dr. Bowditch in his *Navigator*, mentions that in 1580 (a period seventy-eight years earlier than any yet mentioned), the needle at London then pointed eleven degrees and some minutes east. The magnetic pole must then have been situated in about latitude seventy-six degrees north and forty-five degrees east from London, and between that time and 1658 it had moved up to the meridian of London. Now, if we add to this the facts already proved, that from 1658 to the present time, the magnetic pole has moved from the meridian of London to one hundred and eighteen degrees west of it, and having passed over the meridian of New York, the proposition, that the magnetic pole revolves about the North pole once in about six hundred and forty years, is then, I think, fully demonstrated; and there is nothing lacking in the demonstration but the exact time of the revolution, which, as I have said before, must be determined by future careful and accurate observation. It no doubt may be determined with nearly as much accuracy as the periodical return of an eclipse.*

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* The only evidence which I have seen going to disprove my hypothesis of revolution, is a remark of Dr. Bowditch in his *Navigator;* while at the same time giving some dozen or twenty statements of the variations of the compass at different times and different places,

Two other important facts are also proved by what has been shown. First, that in 1658, when the needle pointed due north at London, the magnetic pole was then situated on the meridian of London, and between that and the North pole, and not on the opposite side of the North pole, at one hundred and eighty degrees; and secondly, that the revolution is from east to west. Because, had the magnetic pole then been situated on the opposite side of the North pole from London at one hundred and eighty degrees (and it must have been on one or the other of these points), and revolving in the ratio as we have seen, in order to produce a westerly variation at Greenwich or London, the revolution must have been from west to east. And although in that case the variations at London would have been precisely the same as they have been, yet in passing over one hundred and eighteen degrees of longitude it would place the magnetic pole to-day in longitude sixty-two degrees west, where we know it is not, and the variations at New York would have been at present easterly and increasing, instead of westerly and increasing in that direction as we now know it is. It is, therefore, certain that the revolution is from east to west.

Having now gone so far, and as I believe demonstrated beyond a doubt, the fact of the revolution of the magnetic pole, the subject rises to a higher sphere, and the questions naturally suggested to the mind are, what is polar magnetism, and what is the cause of this revolution?

These are lofty questions, indeed, when we consider the source and influence of the things we are to inquire about, and they are only to be approached with caution and reverence. I will, how-

all of which are perfectly consistent with, and corroborative of, the truth of my position. He also says that in 1708 the variation of the compass in Massachusetts (probably at Cambridge), was eight degrees west; in 1742, six degrees west, and in 1780, two degrees west. This is not possible with the truth of my position, and one or the other must be in error. If he had said east instead of west, it would have been in perfect accordance. It may be an error of print, or the difference may have been caused by local attraction; but I am more inclined to think that the difference arose from the fact that the observers in these cases reversed the poles, and that their meaning was, that the variation of the true north from the needle's point was so many degrees west. If we suppose this to have been the case, and that the variations, as we now define variation, were east and not west, their record would then be in perfect conformity with both the theory and progrees of revolution as we have explained it. Such a supposition is not improbable when we consider that one hundred and sixty years ago the whole subject was but little understood or attended to in this country; and when we reflect that from 1658 to the present time, the magnetic pole has occupied two hundred and ten years in passing from the meridian of London to its present position, it could not have been in a situation to give a westerly variation at Cambridge in 1708, and the foregoing solution of the Cambridge record is the only one possible.

ever, as in the former case, answer these questions at once, as I believe to be the true solution of them, and then give a synopsis of the reasons which direct my judgment to such conclusions.

I regard magnetism as a universal principle, pervading all space, and impressed on all matter, and one of the forces employed to regulate and control the universe; and I consider the revolution of the magnetic pole as being caused by magnetic attraction to the highest center or system, to which the earth in her various revolutions is immediately related. The attraction is from center to center, and the magnetic needle balanced in its horizontal position becomes an indicator only of the line of attraction, and directs itself always to that point on the earth's surface, which is in a line with the center of attraction. There is, therefore, no absolute polar magnetism, or magnetic pole. It is ideal, not real, and like the earth's axis, it is only imaginary, but necessary to be considered in order to illustrate a truth.*

I have said that I regard magnetism as a universal principle, and I so regard it because it is everywhere present in our world—in every place ever visited, in every imaginable position, it is there, possessing the same attributes and exerting the same influence. That which we call a "magnet," however, is not magnetism, any more than an electrified body is electricity—it is simply a magnetized body or substance, capable only of retaining its magnetism for a limited period. Both magnetism and electricity are latent and hidden principles in nature, the very existence of which is a mystery, and of which we know nothing, except as we can witness their effects. They are natural forces, and although latent in themselves, they are yet capable of rising to a force a little short of infinite, whenever circumstances combine, according to their nature, to call them into action. They are not the same, although they may be different phases of the same principle; but I doubt if enough has been learned of either to justify a decision in that particular. They have many affinities in common, such for example as the attraction of iron—also the power of some bodies to arrest and turn away their currents, and of others to receive and retain for a longer or shorter period an impregnation of their qualities, which is again imparted to other bodies when placed in contiguity or brought into contact. The loadstone is only such a substance, to which magnetism has a strong affinity, and which has therefore the power of absorbing and retaining longer than any other known substance the magnetism it has received.

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* In saying that there is no absolute polar magnetism, I must be understood to mean that there is nothing there, at the pole, to cause the attraction of the needle; its motion is governed by a higher law, and by a force with which the locality of the pole has nothing to do.

Both magnetism and electricity may be excited to activity by motion or revolution. Everybody has seen electricity excited by a revolving machine, and if you stand under a revolving belt in a manufactory, you will feel magnetism enough to raise the hair on your head; but no one will for a moment suppose that either magnetism or electricity is created by these motions—they are simply roused from inactivity, as latent heat is rendered active by motion, concussion, or attrition. The difference between the two I conceive to be, that the force of electricity is eccentric, diffusive and equalizing; that of magnetism is concentric — attracting to the center.

From all the phenomena which I have been able to see or observe, I have come to the conclusion that what we call polar magnetism is the result of a magnetic force, rendered active by revolution. As before stated, the force is concentric, attracting to the center. It is, therefore, centripetal, and, considered as a universal principle of nature, it identifies itself with that force which astronomers call the "attraction of gravitation," a force known to exist, but for which no satisfactory cause has ever been assigned; and we are here led to ask, what is that force, if it be not magnetism? By whatever name it may be called, we believe it to be the same force which directs the needle to the pole, and which we habitually call "magnetism." That it is a natural force derived from a latent principle, and put in motion by a forward revolution, I think fairly deducible from what is well known to every astronomer, viz: that the magnetic attraction, or "attraction of gravitation," call it by what name we please, in revolving bodies is the opposite of that centrifugal force created by their revolution, *and always equal to it.* And since the motion of the heavenly bodies is sometimes faster and sometimes slower, as proved by Kepler's law, that in passing round their elliptical courses, they pass over equal areas in equal times, therefore the centrifugal force created by their motion is sometimes greater and sometimes less, which must always be met by an equal development of the opposite and concentric force to keep the planet in her orbit. And it is well known that such development is always obedient to the rate of motion of the body revolving. It is evident, therefore, I think, that the activity of the magnetic force is produced and regulated by forward revolution.

That the attraction of the needle is to the center of the earth, I think is shown by a variety of circumstances. First, the shape of the globe is such that direct rays falling upon its surface necessarily concentrate at its center, and the attracting force would seem to be of that character; and secondly, if a needle be magnetized in but one end, that end will point downward towards the center, though not at all increased in weight; but if both ends be magnetized, and the needle balanced to a horizontal position, it then points *in the direction of a line with the magnetic current.* For the same reason that the attraction is to the center, if a compass be placed near the magnetic pole and compelled to keep its horizontal position, it refuses its duty, and will turn every way at random; but if left to itself, its point tends downward towards the center of the earth, and this is what is called in navigation "the dip of the needle," which increases always as you approach towards the pole.

From these circumstances it has been sometimes assumed that the interior of the earth is a powerful natural magnet; and even with my theory it is so, though not in the sense as has been supposed; for it will be seen at once that, if the attraction were to the center of the earth, by a fixed magnet, then there could be no change of variation in the same locality; and as we have seen that such change does take place, that theory is at once exploded.

We prefer, then, to follow our own choice, and assume that the direction of the needle to the pole is only an indicator of a line of higher attraction; and that the immediate motive power is a concentric magnetic force, rendered active, and *in*volved by revolution. Let us see then what will be the result.

We will suppose that the revolution of the earth on her axis is the governing cause, or controlling force, the attraction being to the center of the earth; then the needle being balanced to a horizontal position, would always, in all places, point due north and south, in a line with the center of motion, which it never does, except in two places at a time (the antipodes of each other and through their lines of longitude); and there could then be no revolution of the magnetic pole, and no variation or change of variation. We must, therefore, look further for our evidence in support of the truth of our position.

Let us suppose, then, that the earth's revolution round the sun is the governing cause, the line of attraction being from the sun's center to the center of the earth.* It will be seen at once that in the earth's revolution round the sun, or with the sun round any other center, her axle, on which she performs her daily revolution, does not and cannot lie in a line with the line of attraction from center to center, but must lie at an angle to it. And how is this? If we draw a line from the North pole to the South polar axle, through or over the Atlantic ocean, and parallel to the earth's axis, we find that the North magnetic pole lies west of such line at an angle to it, and the South magnetic pole lies east of such line at the same angle to it, and the result so far answers to the theory. But here we meet with difficulty; for if the earth's revolution round the sun should be the cause of polar attraction, the line of attraction being at an angle to the earth's axis, then because one body revolving about another body also in motion gains one revolution of the body around which it revolves, therefore the magnetic pole should revolve about the North pole once in every year, which it does not. Again, we have another difficulty—the earth does not revolve about the sun with etiher pole turned towards him; but the tropical zone is forever turned towards the sun, and never the polar regions; and the line of polar attraction is seen to be at a wide angle to the line of the sun's attraction. Confirmatory of our theory, however, there is an inferior polarity in the Indian ocean, north of the equator, sufficient, in passing over it, to disturb the needle; and another in the Pacific ocean, south of the equator, the two at about the same angle to the equator, as the North and South poles to the earth's axis. These polarities may answer to the sun's attraction, and the two, that is to say, the equatorial polarities and the North and South magnetic poles are, as I believe, traveling together in perfect unison with each other. The South Pacific polarity was, I think, discovered by Captain Cook, and has, since its discovery, as laid down by him, moved some twenty or more degrees west, thus keeping pace with the North magnetic pole on this continent.

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* We make no question here of the laws of gravitation as demonstrated by Newton, or the character or degree of its force, which is always directly as the masses of the heavenly bodies, and inversely as the squares of their distances; the only question is the identity of the gravitating force with the magnetism which directs the needle to the pole, by whatever name we designate either. It is worthy of remark here, that Mr. Barlow, in his experiments to correct the influence of iron in the ship on the compass, found that the attraction of iron on the magnet was of the same force and character as the "attraction of gravitation," although he does not appear to have observed it himself. He found that a hollow globe of thin iron had the same influence on the magnet as a solid globe of the same surface dimensions. In other words, he found the attractive force to be directly as the mass, and inversely as the square of the distance.

It is evident, I think, from what has been shown, that the north and south are the superior polarities, to which all others are secondary, because all others are in their influence purely local, while the influence of the north and south is paramount and universal.

We must, therefore, look to a yet higher source for the origin of that magnetic attraction which shall cause the revolution of the magnetic poles in the period of time in which we have seen that they do revolve.*

We have already seen that magnetism is a universal principle, and one of the forces which nature employs in the government of the universe; we have seen, too, that the force which it exerts is centripetal, and identifies itself with the force which controls the motion of gravitating bodies; we have seen that the line of attraction from any center around which the earth may revolve, must be at an angle to her axis on which she daily turns, and that the polar attraction is at such an angle; we have seen that if the attraction of the needle to the pole be governed and controlled by the attraction of magnetism from a center around which the earth revolves, and such attraction is at an angle to the earth's axis, then that point on the earth's surface to which the needle is directed, and which we have called the magnetic pole, shall revolve about the North pole in the same time in which the earth revolves about the governing center of attraction; and we have seen that the magnetic pole does revolve about the North pole once in about six hundred and forty years, taking the period of one hundred and sixty years to be accurate, in which it has been seen that ninety degrees of the revolution has been performed.

All these conditions are necessary to the truth of our theory (and more might be both cited and proved), and they are conditions, all of which we have seen to exist; and one of these conditions, viz: the revolution of that subtle influence and immaterial point which we have called the "magnetic pole," could not exist or be performed by any other means than the magnetic attraction to the center around which the earth revolves.

Our limited astronomy has given us the data of no higher revolution of the earth than that around the sun, although it is inferred from the order of things that she may revolve in company around a higher sphere, and to that we must look for the attracting force that will fulfill the necessity of the case. I shall here be found trespassing slightly on some of those creations of astronomical science which imagination has built on too slight foundations of truth, and which time will, I think, sweep away by discoveries in revolution as simple as that which swept away the ancient systems of astronomy from the faith of mankind. The simple turning of the earth on her axis was found to perform all those wonders, and account for all the phenomena, which men's minds had for centuries supposed employed the might of Heaven to move the whole universe around us for the accommodation of light to our comparatively little world.

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* The North and South poles revolve together, each being always opposite to the other, and at an angle to the earth's axis.

The earth, we know, is balanced within a planetary system, revolving about the sun in perpetual order. We must then admit one of two things, to wit: That either the sun, with his system, revolves about another and a higher system, which is beyond our power of immediate observation; or, that the sun is fixed in the center, and that his system embraces the whole visible and invisible heavens—which we have good evidence that it does not. The supposition is contrary to reason, and contrary to the order of revolution. We therefore assert, as a necessity, that the sun, with his system, revolves about another and a higher system, carrying the earth with him in the same manner as the earth revolves about the sun, carrying the moon with her. This is not a disputed proposition, and I only state it in this form to connect the thread of my argument.

The fact being admitted, it is reasonable to conclude that this is the highest revolution or source of magnetic attraction to which the earth—separately considered—is immediately related. First, because the attraction will necessarily be from system to system; and, secondly, because the earth being situated in the midst of the solar system, a part of it, and only a point in it, the line of attraction would be always nearly the same; or if affected at all by any other revolution, in a planet of the earth's magnitude relatively to these great systems, the effect would be a scarcely perceptible vibration.*

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* I have not time or room here to attempt the demonstration of the truth, but I have no doubt whatever that, although the higher revolution is the governing cause of all, there is yet a daily and a yearly revolution which it would not be difficult to trace. Dr. Bowditch mentions a daily vibration (which is no doubt a revolution), amounting to some minutes of a degree, and I recollect that a few years since the same thing was observed by M. Leverrier, director of the Observatory at Paris, which for want of another reason, he ascribed to expansion by the sun's heat; but although magnetism is more or less intense in a high or low temperature, I cannot accept this as a sufficient cause for a change of varia-

If these premises be all true, then it will follow that what we call the magnetic pole shall revolve about the polar axles of the earth in the same time in which the earth moving forward in company with the solar system performs a complete revolution relatively to that system around which the sun himself revolves. Let me not be misunderstood; this is not the sun's period; that of course is very much greater. The earth is only a satellite of the sun, and in the revolution of which we speak she has but repeated exactly, but on a grander scale, the same phenomena which our own satellite, the moon, performs monthly; accompanying the earth in her orbit, at the return of every full she has performed a complete revolution, relatively to the sun's center, around which the earth herself revolves. So also the earth, moving onward in company with the solar system, performs a complete revolution, relatively to that center around which the sun revolves in his orbit. We have seen that the magnetic poles (for the north and south poles revolve together) perform a complete revolution round the north and south polar axles of the earth once in about six hundred and forty years, and hence we infer that in the same period of time, the earth, still keeping her place in the solar system, performs a complete revolution relatively to another and higher system around which the sun himself, with all his attendant train, revolves. This revolution is accomplished by the simple fact that, because the sun is in motion in an orbit, therefore the earth, in her yearly revolution around his center, performs more than a complete revolution of one primary circle in space; and consequently, in a series of revolutions round the sun, gains one complete year relatively to that center around which the sun revolves. It is a demonstrable truth that every period of time marked by the revolution of the heavenly bodies is greater than one primary circle, for the reason that each and all of the heavenly bodies are themselves also in motion. Our theory then is seen to be that the magnetic attraction to that high center is the force which directs the needle to the pole—that our revolution around that center is the cause of the revolution of the so-called magnetic pole, which last is again the cause of the variations of the compass. The reasons given for

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tion. It may be caused by the sun's attraction, he being sometimes east and sometimes west of us; but the return of the needle during the night to its position of the previous day, is too gradual to be caused by temperature alone. The yearly revolution, when traced out, will, I think, explain satisfactorily why the motion round the great circle is sometimes faster and sometimes almost stationary, or even slightly retrograde.

the truths shown are sufficient for the effect—the effect is purely mechanical and plain to the sense; in harmony with the mechanism of the heavens and the order of revolution, and, until a better reason is shown, I am compelled to believe in its entire truth.*

The cause of gravity has never yet been explained or understood, notwithstanding that much is known of the laws which regulate it. Newton discovered that a falling body was governed by certain laws, and that these laws were applicable to the motions of the heavenly bodies, and this he called gravity, or the "attraction of gravitation." But neither he nor any one else, that I am aware of, ever explained in any satisfactory manner, even to himself, the cause of this gravity. But if my positions be true, it will appear that one law governs polar attraction, centripetal force and the gravitation of bodies, viz: a latent magnetism set at liberty, rendered active, and involved by a forward revolution.

The earth attracts all bodies to its center, and a stone, because of its greater density, will fall quicker through the atmosphere than a feather; but I regard density as only an element of velocity in overcoming the resistance of a medium, and the atmosphere being withdrawn, the feather, attracted by the magnetic force, will fall as quick as a stone.†

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* In limiting the period of the revolution to six hundred and forty years or thereabouts, it will be observed that the correctness of that period depends entirely on the accuracy of the observations and record of the variations of the needle from time to time. And as a consequence of the sensitiveness of the needle to diverting causes from local attraction, and the slowness of the motion, which renders it difficult to note the exact period of its passage of any particular meridian, together with the probable imperfection of the instruments in early use for observation, on which the records depend, even if all we have here said be perfectiy true in principle, the actual period when found may prove to be somewhat longer or shorter than the period here named. Astronomers have suggested an indefinite period of six or seven hundred years, which I have sometimes seen mentioned, and which marks an epoch with them. They may, perhaps, find little difficulty in harmonizing it with this revolution.

† The subtilty and force of magnetism was illustrated by Laplace under the name of gravitation. He says, "that if a new planet were thrown into space, it would instantly feel the force of attraction from surrounding bodies whatever their distance, and the velocity of that force, from one body to the other, would be many million times greater than that of light;" but I am not aware that he ever associated magnetism with gravitation, or treated of it as a universal principle and an active force in nature. Certainly he never considered the two as identical. Most of the inquiries of scientific men into the principles of magnetism have, as I believe, been expended in experiments on magnets, instead of magnetism. I can very well believe Laplace as to the velocity of magnetic attraction. We have an example of velocity in the Atlantic cable. The electric influence is computed to have passed over a distance of two thousand miles in six-tenths of a second, but even that time was probably employed by the thought of the observer in marking the time, and the electric current passed in no appreciable space of time.

There is one other result that must follow the truth of my hypothesis, too important to be omitted here.

It is well known that the motion of any body revolving about another body, also in motion, is necessarily spiral, and therefore the motion of the magnetic pole, revolving about the North pole, and being governed and controlled by the attraction of a body in motion around which the earth is revolving, shall also be spiral, never returning to exactly the same point. And hence because one law and one force governs both the motion of the earth and the revolution of the magnetic pole, therefore the polar axle of the earth shall change its position with every revolution of the magnetic pole, in such manner that the present poles of the earth's axis, in her diurnal revolutions, will, or may, at length reach the present line of the equator, and the equator will then become the poles; and thus the idea suggested by geology, that the present poles of the earth have, at some time of the earth's existence, been an equatorial region, becomes a problem solved, and reduced to a simple and undeniable truth. Not a doubt exists in my mind that such has been the fact and will be again; and I am not less satisfied that the glacial theory of Professor Agassiz, so far as the fact is concerned, that parts of our own land, and of others in Europe and elsewhere, have at some time been the country of glaciers, is no longer a speculative idea, but a mathematically demonstrable truth.*

The early system of astronomy was, I think, incompetent to the solution of a question like the revolution of the solar system; and modern astronomy has done so little towards it, that it must be considered as yet open to examination and argument. I have hope, therefore, that the suggestions here made may prove a step towards a more perfect knowledge of it.

Years ago, when I first thought of the subject here treated of, it was only in relation to the variations of the compass as observed at sea, and its practical application in commerce and navigation. But I perceive that I have risen to much higher themes, and perhaps some may say, meddled with things too high for me; but I am unable to perceive that I have at any time gone beyond a just inference from the truths shown.

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* There is a truth known to astronomers, which I think strongly confirms this point of my argument. It is this: In the longitude of Athens it is known that the sun in Cancer does not come so far north, by nearly a degree, as it did two thousand years ago. Astronomers have inferred therefrom that the tropics are narrowing, and the earth consequently is drawing nearer to the sun. But this I think is a mistake, and that the phenomenon mentioned proceeds from the change in the line of the equator, as I have explained it; and that if we had the opportunity, two thousand years ago, of observing south on the meridian of Athens, it would then appear that Capricorn has receded south to the same extent as Cancer, and *vice versa* at the antipodes. It would also depend on what distance the meridian of Athens may be from the point where the former line of the tropic would bisect the present line, whether on some other meridian, distant from Athens, the sun's recession may not have been much greater than is seen at Athens. But for all evidence of this kind, the observations of astronomers are totally wanting.

The simplification of the vast speculative ideas of geologists and others, which this examination has suggested to my mind—my thorough conviction of their essential truth, and that the truths here shown may be availed of for the increase of knowledge and the improvement of science—are my reasons for making public my reflections on these matters. I submit them to the fate which future developments may award to their truth or falsity.

At the conclusion of this paper the Chairman remarked, that the view now advanced regarding the moving poles, was about the same as that of the late Dr. Sherwood, of this city. Thirty years ago he put forth the idea that the two magnetic poles of the northern hemisphere revolved around the axis of the earth once in about six hundred and sixty-six years. That the line of no variation is now moving westward, is well settled; but observations prove that such lines undergo very complex alterations, and that the magnetism of our globe is not permanent. This subject has occupied the attention of physicists for many years, and the best idea of what has been accomplished in this direction, may be obtained by perusing the article on "Terrestrial Magnetism," in *Nichols' Cyclopedia of Physical Sciences.**

Prof. Vanderweyde took exception to the principal positions of Mr. Parker, and said, there were complications involved in this question which could not as yet be satisfactorily accounted for. Thermo-electric currents, generated by the unequal heating of the globe by the exposure of one-half of its surface to the direct rays of the sun, are now supposed to be the cause of the magnetic poles; but the magnetism of the earth seems to be influenced in some degree by other causes.

At a late hour the Association adjourned.

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* All notions having the conception of four poles as their basis have been utterly discarded by the physical investigations of the illustrious Gaus; nor did Hansteen himself (who gave to these poles periods of revolution) "imagine that the arduous question, as to the nature of terrestrial magnetism, could be resolved by any scheme so artificial."—*Nichols' Cyclopedia, p.* 556.

## April 16, 1868.

Prof. S. D. Tillman in the chair.

Dr. Feuchtwanger, who had just returned from a visit to Nova Scotia, presented specimens of iron ore from a recently discovered bed near Truro, which contained from sixty to sixty-five per cent of pure iron. Plenty of wood and good soft coal, from which charcoal or coke can be made, are found in the neighborhood of the ore. Pig-iron could be made there for seven dollars in gold per ton.

### *NEW OIL FEEDER.*

Mr. Pemberton exhibited Nickershaw's new oil feeders for the journals of machinery. The white metal in these oil cups was considered an excellent feature, for the reason that the white metal will not oxidize, while brass or copper render the oil of a greenish color, and frequently of a gummy consistence, that does not properly lubricate.

### *ELECTRO-MAGNETIC LOCOMOTIVES.*

Mr. F. G. Fowler illustrated on the blackboard his new electromagnetic engine, and spoke as follows:

This sketch represents an application of electro-magnetism for producing mechanical motion, and applied to a useful purpose. If I am rightly informed, none of the attempts for using this agent as a motor have been successful. We often hear it announced that some scientific gentleman or sanguine inventor proposes to drive a machine or propel a boat by electro-magnetism. That is about the last of it, and, with the exception of the telegraph, and some kinds of signaling and bell-ringing, electro-magnetism, for the purpose of producing mechanical force, has in no case been permanently successful.

This machine is not one that somebody proposes to construct, but one that has been in successful operation for more than a year; in which time it has proved its superiority, not only in cheapness, but by answering the purpose for which it was intended, better than any other device. It is a small car propelled by electro-magnetism, and relates to an improvement in that class of institutions known as business schools. It originated with Prof. A. Davidson, and is in practical operation in the Commercial College of Rutledge & Davidson, at Springfield, Illinois.

In order to better illustrate the application of this mechanism, I might state that the exercises in these institutions, in the early part of their history were almost entirely of a theoretical nature, the problems to be solved requiring abstract mental operations. More recently the method of teaching has been improved by being made more practical. The exercises, instead of being paper calculations, have been transactions, the student being provided with currency and specimens of merchandise for the purpose.

These practical exercises have ever been regarded with high favor by the most eminent educators and skillful teachers. But in introducing them to any extent an inconvenience resulted, for it became necessary for the student or teacher to go from one part of the room to another in making exchanges; or it became necessary to employ a number of boys to convey packages, remittances, etc., as might be required, either plan being attended by interruptions, noise, and the consumption of time. This improvement consists in introducing a great number of systematized practical transactions, a variety of merchandise and appliances of trade, fitting the room so as to represent commercial centers, and connecting the same by a miniature railway, which forms a noiseless and easily controlled means of intercommunication with all parts of the hall. By this means the student can sit quietly at his desk and dispatch for any article, or make an exchange in any part of the room. The labors of the teachers are greatly lessened; a great variety of practical transactions are easily introduced, and the same are dispatched with a celerity, harmony and precision that could be attained in no other way.

The author read a paragraph from *Rutledge & Davidson's Business Journal*, showing the manner in which his improvement is used in teaching commercial transactions, and then said:

My principal object, however, is to explain the mechanical construction of the locomotive, which propels the train above referred to. The general arrangement is as follows: A stationary battery, placed in an adjoining room, supplies the electric fluid, which, being conveyed by the truck to the engine, is the source of power which puts the same in motion. The magnets are ten in number, of the type made use of by telegraph instrument makers in constructing registering instruments, it being ascertained that a large number of small magnets are much more effective than a few large magnets. They are arranged in pairs, and occupy the space usually allotted to the boiler. The circulation of the electric fluid to the magnets is somewhat peculiar. It is not done by passing the current successively through the magnets, forming a single circuit, but by passing it through a number of wires, forming many short circuits. In other words, the positive wire has a number of branches, which pass to the different magnets, the same being brought together again to form the magnetic wire, the only caution being necessary is to have all the routes or circuits of precisely the same length.

The armatures are attached to a single rod, and vibrate simultaneously, being attracted in one direction by the magnets, and drawn back again by the elastic force of a spring. The stroke of the armatures is about one-twentieth of an inch. The short stroke of the armatures is increased to three-eighths of an inch through the agency of multiplying levers. It is simply a straight lever, pivoted at one end. The rod or stem to which the armatures are attached is connected near the pivot.

The stroke of the multiplying lever is communicated to the axle of the driving wheel, to which it imparts a rotary motion. It does not pass directly to the driving wheels, but through a toggle-joint, for the purpose of equalizing the pressure of the magnets. For example, as the armatures are withdrawn from the magnets, their attractive force diminishes as the square of the distance passed over. A toggle-joint may be so proportioned that its power or leverage will increase as the square of the distance passed over. Both are so arranged, that when the magnets are at their weakest point, the toggle-joint is at its strongest, and *vice versa.* By this means, the force of the magnets is equalized, and the pulling power of the engine always the same.

The reciprocating motion of the toggle-joint is communicated to the driving wheels, not by a crank as in Page's engine, but by what would be most readily understood as a pawl and rachet wheel. The wheel, however, is smooth, the pawl acting on the same by friction, and is noiseless in its operation. The liability of a crank to stick on the center, is thereby avoided, and the magnets acting nearly all the time, are much more effective than when combined with the crank movement, when they are acting but half of the time.

The current is opened and closed by a current breaker, which is operated by the vibrating lever, and is most perfect in its operation. By long use, one of the platinum ribs becomes enlarged at the expense of the other.. By reversing the current, the metal is redeposited to the point from which it was transferred, and the points can thus be preserved for an indefinite length of time.

When put in operation, it continues to run without any attention till the battery is exhausted, which generally requires about three days. It can be stopped at any time, by laying a wire, or other metallic connection across the rails, and started by removing the same. By this means its movements can be controlled, in the most perfect manner from any part of the hall.

The engine is built on a scale of one inch to the foot, the train being about five feet in length. The circuit of the hall is somewhat less than three hundred feet, and the maximum speed which the engine has attained is about six feet per second.

The weight of the engine is eighteen pounds; that of the train about twelve pounds, and it is capable of carrying a maximum burden of fifty pounds, making a total of nearly eighty pounds. It is driven by a battery of seven Grove's cups; and the working expenses are about one dollar and fifty cents per week.

The superior efficiency of this machine is doubtless due, first, to the employment of a great number of small magnets, instead of a few large magnets; second, to the passage of the electric fluid through a great number of short circuits, instead of one long circuit; third, the proximity of the attracting parts, the armatures making a great number of short strokes instead of a few long strokes; fourth, the equalization of the attractive force of the magnet; fifth, dispensing with the crank movement, and causing the magnets to act nearly all the time; sixth, the novel arrangement of the current breaker, by which the electric fluid is enabled to pass rapidly and freely through the machine.

## *MAGNETISM.*

Prof. Vanderweyde then addressed the Association upon mineral magnetism. Dr. V. reviewed briefly the history of magnetism from its earliest discovery to the present, and made some interesting experiments. He showed that north poles repel each other, and south poles do the same, but north poles attract south poles, and *vice versa.* He also explained how steel can be magnetized by means of the magnetism of the earth, without a magnet. The Doctor also explained that the magnetic point of the earth lies somewhere on the northern part of this continent, nearly on a line with the Mississippi; but the precise point is not yet determined. Humboldt recommended the erection of magnetic observatories all over the world, and scientific men take observations four times in a year in all parts of the world, and they find that the needle points toward the west from China, and toward the east in California, showing thereby that the magnetic line lies here in America. Dr.

V. explained also, by experiments, the variation and induction of magnets. Soft iron will not retain magnetism, nor will iron placed horizontally at right angles to the magnetic meridian retain it. And upon the knowledge of this fact a very valuable discovery has been made recently in England, namely, testing axles for locomotives, &c., by means of the needle, which detects the slighest flaw in the bars. We know little yet of the principles and properties of magnetism, but we know that the earth is one vast magnet. There are four metals that may be magnetized, namely, iron, cobalt, nickel, and manganese; but it has been recently ascertained that everything, except nitrogen, is magnetic, if we have instruments delicate enough to test them.

The subject was afterward discussed by Drs. Edwards, Bradley, Smith, and others, who questioned Dr. Vanderweyde in regard to the lines of magnetic variation of the earth, of which nothing very definite is yet known; but within the last two hundred years it has shifted from east to west, and it is probable that the mass of the material universe, being no doubt as highly magnetic as our earth, must by their continually changing poles also influence the magnetic pole of our earth.

## *HISTORY OF INDUCTION.*

Prof. Charles G. Page, of Washington, sent to the Chairman of the Polytechnic his "History of the Induction Coil, and its Electrostatic Developments," in three parts, with a request that it should be laid before the Association.* The work is too voluminous to be given in full. The following, mostly from Part I, embraces the essential points made by the author:

### I. INDUCTION AND INDUCTION APPARATUS.

The first galvanic or volta-electric induction apparatus, by which shocks, together with other indications of electricity of high intensity, were obtained from a secondary coil—that is, a coil not included within the battery circuit—was made by Prof. Page. This was a regularly organized apparatus of remarkable power, a full description of which was communicated to *Silliman's Journal*, under date of May 12, 1836, with the following caption: "Method of increasing shocks, and experiments with Prof. Henry's apparatus

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* The letter of this distinguished inventor was written while confined to his room by illness, and was probably one of the last, relating to science, written by him. Professor Charles Grafton Page expired on the 5th day of May, 1868.

Fig. 1.

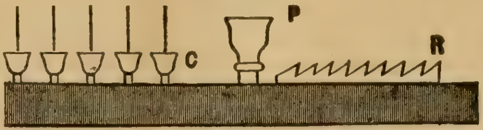


Fig. 2.

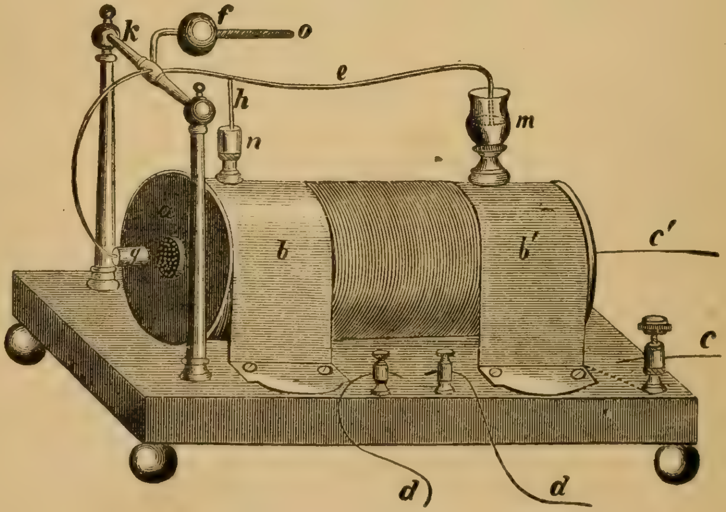


*Fig. $2^1$.*

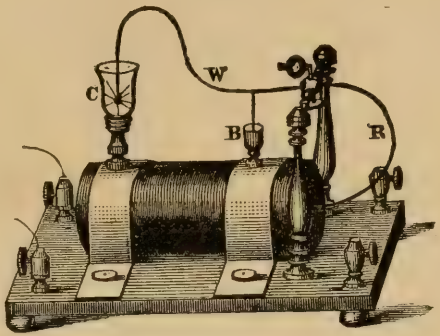
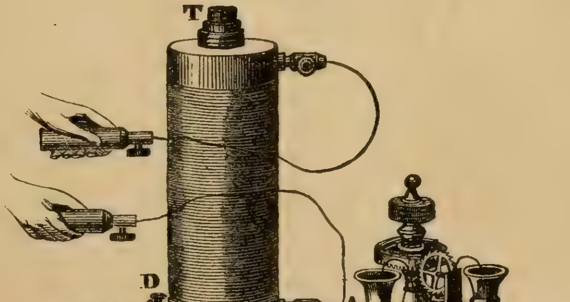


*Fig. 3.*



for obtaining shocks and sparks from the Calorimotor, by C. G. Page, Salem, Mass." This apparatus (Fig. 1) was so graduated that the strength of the induced current could be varied at pleasure; was furnished with mechanical and automatic circuit-breakers, and the now celebrated spark-arresting circuit-breaker, and produced secondary or induced currents from coils outside of the battery or primary circuit, and of sufficient intensity to charge a Leyden jar. The communication closes with this remark: "We have, then, in this instrument a battery by itself, from which shocks of all grades can be obtained; and, in cases of the medical application of galvanism, it must prove far more convenient than the ordinary methods." The "ordinary methods" at that time were the cumbersome galvanic batteries, the frictional electric machine, and the magneto-electric machine. The description of Prof. Henry's apparatus, hereafter noticed, and that of Prof. Page, were both received in London by Mr. Sturgeon, the editor of *The Annals of Electricity and Magnetism*, at the same time, and published side by side, and with the following comment by the editor: "Mr. Page's variations of Prof. Henry's experiments are very important." (*Sturgeon's Annals, May*, 1837.) They have proved to be important, inasmuch as the principle of construction adopted in the Page coil is that of an economical use of battery power, which has been applied since that time in every form of induction apparatus, whether for remedial or philosophical use and research. The principle is simply this: In order to obtain induced currents of high intensity from a battery of a single or only a few pairs of plates, an extra and much longer circuit must be employed for the induced current than that used to transmit the battery current; or, more briefly, the induced or secondary circuit must be much longer than the inducing or primary circuit. In Prof. Henry's experiments, only a primary circuit was used. In Faraday's celebrated experiments on induction, the primary and secondary circuits were of nearly equal length—the secondary circuit being actually a little shorter than the primary by a foot and one-half. The current he obtained from his secondary circuit had less intensity than the terminal secondary or induced current from his primary circuit. Hence he makes no mention of shocks received from the secondary circuit, while he obtained them freely from his primary circuit. In Faraday's first experiments, in 1831, and in his experiments in 1834, both relating to the subject of induction, he used the same arrangement of his coils; and it is somewhat remarkable that, in the multitude of his experiments, it did not occur to him to try the effect of a longer circuit for his secondary coil. In his beautiful series of experiments in 1831, wherein he demonstrated the induction of currents, and, also, in his ninth series, published in 1834, on the induction of a currrent on itself, he contemplated no practical application of the principles developed, and resorted to no means of increasing the power of the induced currents, being content with mere exhibition of the current itself by feeble manifestations.

The credit of the first induction coil has generally been ascribed by European authors to Prof. Callan, of Maynooth College, Ireland. Prof. Callan's experiments and apparatus were, indeed, considerably in advance of his European cotemporaries, but were subsequent to those of Prof. Page; and, in order more fully to establish the claim of Prof. Page to the first induction apparatus, and to give every discoverer, inventor and contributor his true chronological position, a resumé is here given of the progress of the subject of induction since its first discovery by Faraday, who, for the sake of distinction, from static-electrical induction, adopted the term "volta-electric induction." In 1825, Faraday attempted to prove, experimentally, volta-electric induction, and failed, although the subsequent verification of his theory was made by similar experiments and arrangements. (*Phil. Trans.* 1832, *p.* 162.) In November, 1831, he read before the Royal Society an account of his discovery of the induction of currents, showing that the passage of a galvanic current in one wire induced a momentary current in a contiguous wire, and that the movement of the wire, transmitting a current, to and from another wire, also developed momentary currents in the latter. In the same paper he also announced the interesting discovery of the development of electricity by magnetism, the electric currents being produced by the development of electro-magnetism in its cessation, and, also, by the motion of a steel magnet to and from its keeper—the latter being surrounded by a coil of wire, connected with a remote galvanometer. With the electro-magnet he obtained a slight spark by using charcoal points, but failed to obtain the spark from the experiments with the steel magnets. By using a very powerful loadstone he was able to convulse a frog's leg, and he thought he produced a slight sensation upon the tongue. This species he termed magneto-electric induction. The currents in neither case were of sufficient intensity to produce a shock, although he used very large batteries. It is a very remarkable circumstance that, in each experiment insti-

Fig. 4.

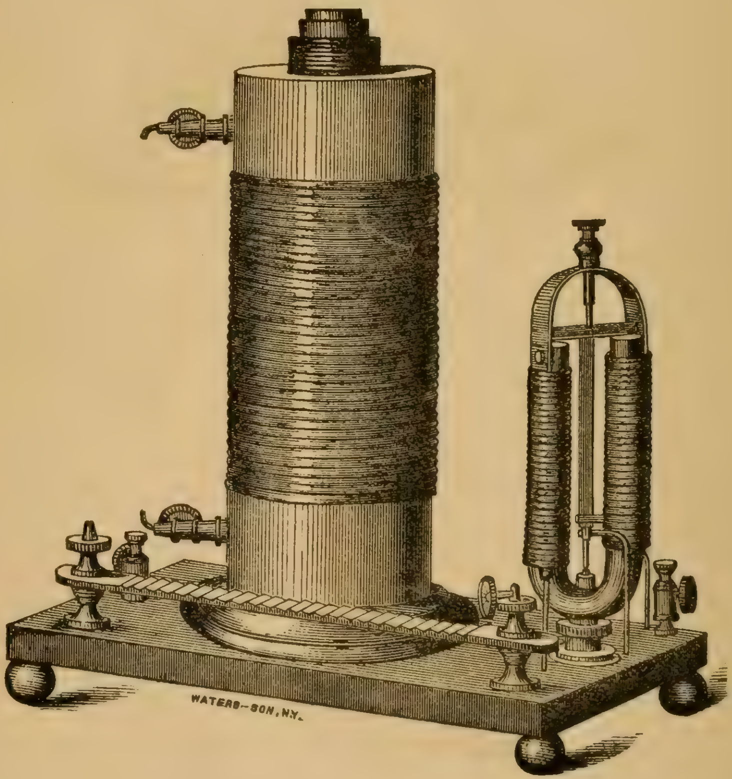

WATERS-SON, N.Y.

*Fig. 5.*

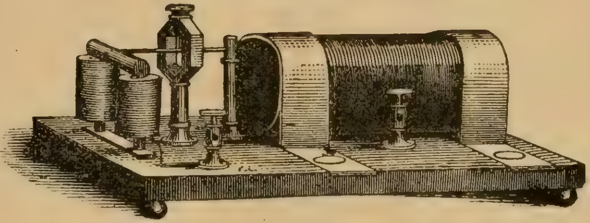


*Fig. 6.*

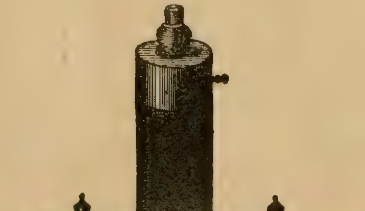


Fig. 7.

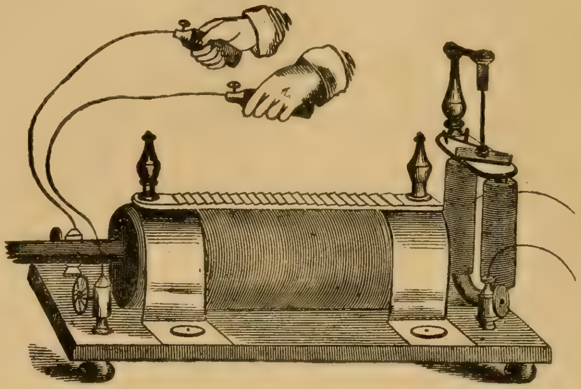


Fig. 8.

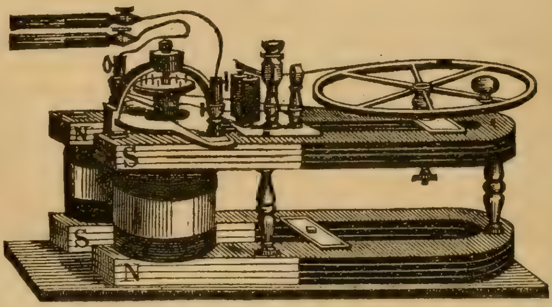


Fig. 9.

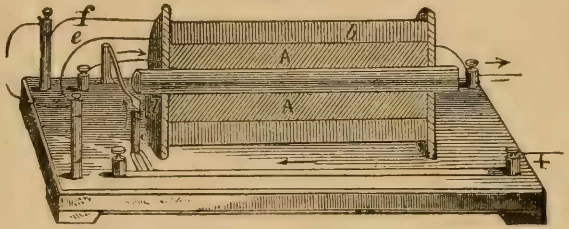
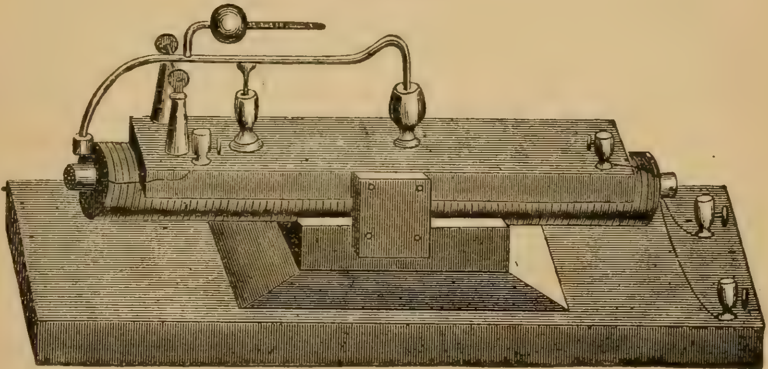


Fig. 10.



tuted, with a view to develop the induced current in a separate or secondary coil, Faraday should have used the longer coil for the battery circuit, and the shorter for the secondary circuit. Simply reversing the order of his coils would have given him quite a difference in his results. From the secondary, by volta-electric induction, he says: "I could obtain no evidence by the tongue, by spark, or by heating of fine wire or charcoal; nor could I obtain any chemical effects." The current was indicated only by the galvanometer and its magnetic effects.

On the 30th March, 1832, Mr. Forbes, of Edinburgh, obtained a spark from the use of the steel magnet. (May number, *Annals of Philosophy;* also *Silliman's Journal*, vol. 22, page 408.)

In the latter part of June, 1832, Prof. Henry commenced experiments on magneto-electric induction, of similar purport with those of Faraday, and was more successful in the production of sparks. These were communicated in the July number of *Silliman's Journal* for 1832. In the same number, Prof. Henry announced the interesting facts, that when a very short wire (a foot in length), joined the poles of a small battery, in such a condition as to give no spark with this wire, a wire thirty or forty feet in length would give a bright spark on breaking the circuit, and that the "effect appeared to be somewhat increased by coiling the wire into a helix." The battery in this case, was spoken of as "a small battery," the number of pairs of plates, a very important point, not being mentioned. It is stated that "if moderately excited by diluted acid, it would not give a spark with a wire one foot in length on breaking the circuit," but if the action of the battery be very intense, a "a spark will be given by a short wire." The inference is rather in favor of one pair of plates, or perhaps several pairs joined as one, inasmuch as one foot of wire was used to join the poles.

Prof. Henry referred this phenomenon to the class of volta or magneto-electric induction. No shock was obtained in either the experiments of Henry or Forbes.

In the early part of 1833, Prof. Dal Negro asserted that the "separating spark of a voltaic pile originated at least in part, from magneto-electricity, and hence would be more intense if the conducting wire were coiled around a bar of iron." (*Annali delle Scienze*, March and April, 1833; also *Biblioth. Univ.*, July and August.) This was the first public announcement in relation to the augmentation of the spark of separation as produced by a coil surrounding an electro-magnet, and laid the foundation for the third species of current induction, which we shall call volta magnetic-electric induction. The three species, volta electric induction, magneto-electric induction, and volta magneto-electric induction, are, undoubtedly, results from the action of electricity; but, as they are all produced under different arrangements and conditions, it is important to preserve these distinctions.

On the 18th December, 1834, Faraday communicated to the Royal Society an interesting paper "on the influence by induction of an electric current on itself," containing an account of the discovery of the production of sparks and shocks from a single voltaic pair. Faraday received his information on this point from Mr. William Jenkins, who must, therefore, in the absence of any other record, be considered the discoverer of this important and interesting fact. Faraday ingenuously relates the circumstance as follows: Mr. Jenkins informed him that "if an ordinary wire of short length be used as the medium of communication between the two plates of a battery of a single pair of metals, no management will enable the experimenter to obtain an electric shock from this wire; but if the wire which surrounds an electro-magnet be used, a shock is felt each time the contact with the electromotor is broken, provided the ends of the wire be grasped, one in each hand." This discovery rests upon the same principle as that of Prof. Henry's, already cited, as announced by him in 1831; but its distinguishing interest and importance consists in the production of sparks and shocks from a single voltaic pair. Faraday also announced the same in the November number of the *London and Edinburgh Philosophical Magazine* for 1834. Faraday used two helices coiled around a paste-board tube—one ninety-six, and the other ninety-four and a half feet in length, the former to transmit the battery current, and the latter to exhibit the induced current. Sparks and shocks were obtained from the inducing or first helix, and sparks from the second helix, but no shocks. It will be noted here, that both the helices were about the same length. An iron bar was introduced in the paste-board tube to increase the intensity of the induced currents.

On the 16th January, 1835, Prof. Henry made a communication to the American Philosophical Society on the same subject, and his paper, with the following title, was read on the 6th February, 1835: "On the influence of a spiral conductor in increasing the intensity of electricity from a galvanic arrangement of a single pair."

This influence was exhibited in an interesting series of experiments by the aid of helices of wire, and the winding of a flat copper strip or ribbon into a spiral, the greatest length of which was ninety-six feet. With a large calorimotor of eight pairs, shocks were felt as far as the elbow.

In the latter part of 1835, Dr. Neef, of Frankfort-on-the-Main, published *Poggendorff's Annals*, vol. 36, page 352, an account of experiments for the purpose of obtaining a rapid succession of shocks by a mechanical contrivance called a "lightning wheel," for making and breaking rapidly the circuit with a voltaic pile, both with and without the interposition of coiled conductors. The wheel consisted of a circular table or disc of copper six and a half inches in diameter, mounted to revolve on a vertical axis. The upper face of this disc presented thirty-six strips of wood, or other non-conducting material, inlaid with strips of copper. A conductor resting upon the upper face over the strips, was for connection with one pole of the battery, the other pole being in connection with the bearings of the wheel. As the wheel was turned, the circuit was broken thirty-six times for every revolution. It was tried with a voltaic pile, to obtain a rapid succession of contacts, and also with a coil of wire surrounding a bar of soft iron, and was found to produce novel and important physiological effects due to the rapid succession of small shocks. It was contemplated by Dr. Neef for use for medical purposes. The circuit-breaker was in reality a production of Mr. Wagner, a friend of Dr. Neef. It is the first recorded account of a mechanical circuit-breaker applied for this purpose. The apparatus was, however, cumbrous; and as only a voltaic pile was used and no secondary circuit around the electro-magnet employed, the action was too feeble and inconstant for practical application and must have gone speedily into disuse. Dr. Neef revived the subject in 1839, after his introduction of an automatic circuit-breaker It is interesting to note, that Dr. Neef suggests in this paper the use of galvanic baths, now so much in vogue.

Perhaps the experiments of M. Masson, of France, were in advance of those of Dr. Neef, both as regards the coil, its physiological effects, and the use of a mechanical circuit-breaker. Du Moncel, in his *Exposé des Applications de l'Ectricité*, 1856, says that "M. Masson was one of the first who perfected the apparatus for volta-electric induction. That in 1836 he employed a toothed wheel (*roue dentée*) revolving against a metallic spring for breaking the circuit with a coil, and obtained currents of some intensity." We find a communication from M. Masson towards the close of the year 1837, in the *Annales de Chemie*, vol. 66, page 28, on this subject, in which he refers to his "*Memoire*" to the French Academy, in June, 1835, as containing the substance of his paper. We also find, in the *Compte Rendu*, 1837, a report of M. M. Becquerel and Savary of the Seance of 27th of March, 1836, on the memoir of M. Masson, which they state was received soon after the discoveries of Faraday on the induction of a current on itself, were made known in Paris. This is somewhat indefinite; but as these discoveries were published in the latter part of 1834 and beginning of 1835, we may be safe in taking the date of June, 1835, for M. Masson's experiments. Becquerel's report mentions the coil of 1,400 feet of wire, the use of a number of pairs of Wollaston battery, and the toothed wheel circuit-breaker. Also the production of shocks of sufficient power to kill a cat. It is probable, therefore, that M. Masson preceded Dr. Neef, and that he was the first to obtain secondary currents of high intensity from a primary circuit by using an intensity battery, and to use a mechanical circuit-breaker in connection with the coil. M. Masson, in concluding his paper referring to the publication of Dr. Neef's experiments, says they were "made subsequent to his own." M. Masson's toothed wheel was revolved by a pulley, band and multiplying wheel. He did not employ a secondary circuit, and the great length of his circuit wire and extended batteries rendered the whole too cumbrous for medical uses.

In 1836 Prof. Page communicated to *Silliman's Journal*, vol. 31, page 137, a description of an induction apparatus; an engraving is given of the apparatus, and on reading the description it is found to be distinct from any which preceded it, in several important particulars. It announces the interesting and very important discovery that the "shock is very much increased by breaking the circuit over mercury covered with water or with naphtha." A description is given of two mechanical circuit-breakers for producing a rapid succession of shocks—one made of a rasp, and the other a revolving spur-wheel. A postscript to the article, dated "Salem, June, 1836," describes an automatic circuit-breaker, consisting of Barlow's spur-wheel included in the circuit. It mentions the "charging of a Leyden jar by the secondary current," and the decomposition of water, together with several other novel and interesting experiments. But the most important feature of novelty is that of "increasing shocks," as the caption indicates, by the use of a longer coil for the secondary current than that used to transmit the battery current, and also in producing shocks from a purely secondary coil exterior to the primary coil.*

The next induction coil we find to be that of Prof. Callan, of Maynooth College, Ireland, allusion to which has been before made. Prof. Callan's description of this coil is found in the *London and Edinburgh Philosophical Magazine* for December, 1836. This communication is dated August 23, 1836. Prof. Callan's coil is described as consisting of two coils of copper wire, wound upon a bar of iron two feet long, and one inch in diameter. "These wires were in two lengths of 200 feet each, of the same size, and the end of the first coil and the beginning of the second were immersed into the same cup of mercury—the voltaic current was passed through the first coil only, and the shock taken by making a communication with the beginning of the first coil, and with the end of the second." It was not stated whether one coil was exterior to the other, or whether they were side by side on different portions of the bar. The mode of obtaining the intensity current from the secondary current was precisely a repetition of that of Prof. Page's. No mention is made by Prof. Callan of a shock or a current from the purely secondary circuit.

In the April No. of *Sturgeon's Annals* for 1837, Prof. Callan communicated a brief article describing a complicated mechanical contrivance for breaking the primary circuit with rapidity, so as to obtain shocks from the electro-magnet. In the course of this article, he speaks of the thick wire for the primary, and thin wire for the secondary circuit, but does not give the length of either. The communication was without date. Thin or fine wire is purely a relative expression, but here is meant a wire for the secondary smaller than that used for the primary circuit. We are unable to trace accurately the history of the introduction of fine wires for intensity circuits. The wire in common use for conductors and coils, from the commencement of experiments in electro-magnetism, was bell wire, or No. 16, which is about one-sixteenth of an inch thick; and unless authors specify the diameters of wires, we take it for granted that copper wire means bell-wire size. Mr. Clarke, the author of one of the principal forms of magneto-electric machines, says: "Having, in November, 1834, tried the effects produced by coils varying in diameter, I found that the thick copper bell wire gave brilliant sparks, but no perceptible shock, whilst, on the contrary, very fine wire gave powerful shocks, but very indifferent sparks. I took advantage of my discovery, and furnished my machines with two armatures—one of thick wire, and one of fine wire." (*Lond. and Edin. Phil. Magazine* for October, 1836.) So far as we are able to learn, Prof. Callan was the first to adopt the fine wire for the secondary coil, in combination with a coarser primary wire on the electro-magnet.

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* Prof. Page, at the time of this announcement, was a medical student, and had no facilities at that time for obtaining a knowledge of the progression of electrical science in Europe. Information, however, of Prof. Page's experiments was carried to Europe, by Francis Peabody, of Salem, Mass., and communicated to Mr. Sturgeon in advance of their publication here.

Some time in September, 1837, Prof. M'Gauley, of Dublin, exhibited at the meeting of the British Association, at Liverpool, an electro-magnetic coil apparatus, which though very awkwardly constructed, yet embraced one very important and ingenious feature, viz: an automatic circuit-breaker, which was, in one particular, the type of most of the automatic circuit-breakers now in use. It, however, was deficient in having no adjustment to vary its force.

The next coil apparatus of Professor Page was communicated under date of June 2d, 1838, for *Silliman's Journal*, and published in October following. In this machine, called the Magneto-Electric Multiplier, the primary and secondary circuits were insulated from, and independent of, each other, and wound upon a bundle of iron wires, bent into a horse-shoe or U form. The circuit-breaker was so arranged upon a shaft bearing an armature that the circuit might be broken at the instant the armature required the maximum of mechanical force to cause it to recede from the poles of the magnet, and thus effect the more sudden neutralization of the magnetic forces and agument the intensity of the secondary. It is emphatically said of this coil, that the "secondary is insulated from, and entirely independent of, the primary."

The next published account of induction apparatus is also one of Prof. Page's. The first description of this improvement is in a work published by Daniel Davis, Jr., of Boston, in November, 1838. The little work of seventy-two pages, though entitled a "Descriptive Catalogue," is essentially a treatise upon the subject of electro-magnetism and magnetic electricity. For the sake of distinction, we shall call it Davis' first manual. Three pages and a half are devoted to the description and explanation of this new induction coil and apparatus. It embraced two important and distinctive features of construction. (See Fig. 2.) One, the automatic device for breaking the circuit, which is effected by the attraction of a small piece of iron, G, by one end of the magnet, the iron being attached to a wire, E, suspended over a glass mercury cup, M, in such manner that the motion of the iron lifts the wire from the mercury and breaks the circuit. The distance between the iron and magnet is easily adjusted, as also the force with which it is held, and pulled back by means of the adjustable weight, F, so that the length and rapidity of the vibration may be regulated at pleasure. It was the first circuit-breaker in which the resistance was adjustable without altering the attractive force.

We may form some idea of the importance attached to this induction apparatus, from the fact that, in a supplementary letter-sheet catalogue issued the next year, Mr. Davis advertises three different sizes of the same—one with 3,000 feet of fine wire, one with 2,000 feet, and one with 1,000 feet, the prices being $29, $15 and $10. He also described an interesting modification of his own invention of the spark-arresting circuit-breaker, causing the wire to vibrate in the mercury cup by means of clock-work. (See Fig. 3.) In connection with this, the coils were placed in a vertical position. There was also attached to the base-board the steel rasp, the original circuit-breaker adopted by Prof. Page in 1836.

The first practical magneto-electric machine was made by Mr. Saxton, of Philadelphia, but the way was first opened for unlimited increase of the magneto-electric current, by increasing the number of magnets and armatures, instead of increasing the size of the magnet and coils, to which, of course, there would have soon been found a limit.

In *Silliman's Journal* (July, 1840), is found a lengthy account of the experiments of Prof. Henry upon induction, communicated to the American Philosophical Society November 2d, 1838, in which he discovered the different orders of currents produced by induced currents. The paper is full of scientific interest, but nothing novel is presented in the construction of apparatus.

In the year 1842, according to Becquerel, or according to Du Moncel, about or towards the year 1842 ("vers l'année"), M. M. Masson and Breguet also undertook to verify the identity of dynamic and static electricity by the operations of the secondary current. Their memoir is found in the *Annales des Chimie*, vol. 4, 1842, page 129. It is there stated that the memoir was presented to the Academy of Sciences 23d August, 1841. They employed powerful batteries, forty pairs Daniell's, and a coil of wire 1,300 metres in length, and two and a half millimetres in diameter, divided into two equal lengths, which were wound in juxtaposition into a bobbin or coil, of such proportions that the central or core opening was over six inches in diameter.

In 1850 some remarkable experiments with induction coils were made by Prof. Page, and published in *Silliman's Journal.* Three reports on the subject may be found in vol. 10, No. 80, November, 1850, page 349; vol. 11, No. 31, January, 1851, page 88; and vol. 11, No. 32, March, 1851, page 191. The coils and magnetic bars were on a grand scale, and by far the most powerful magnets ever produced. One of the helices raised within its central opening "a bar of iron one thousand and forty pounds in weight, vibrating in the air without visible support." These helices have been described elsewhere as made of square wire one-quarter inch thick, of very pure copper, and the battery used from fifty to one hundred pairs Groves, with platinum plates one hundred square inches immersed. Very interesting experiments were performed, showing that the time required to raise the current to its maximum in the coils varied, according to circumstances, from one-sixth of a second to two seconds, and that the subsidence of the current was in the same time. Coils were closed after the battery current had been withdrawn, and afterwards opened within a half second, and a current still found to be flowing. The time required was much less when no magnetic bar was inclosed in the helices, from one-third to one-half less. The most striking results, however, from these coils, was the immense length of the terminal secondary or separation spark. When the current was allowed to attain its full power, the sudden separation of the wires produced sparks eight inches in length. When the separation was slow, the sparks were short, and spread out more like a flame. An extraordinary change was produced in the character of this secondary spark by magnetic action. When the circuit was broken at a distance of several feet from the magnet, the spark was attended with very little noise. But as the point of separation approached the magnet, the noise increased, until, when the circuit was broken on the pole of the magnet, the report was as loud as a pistol, and the spark diminished in length, and spreading out as large as the palm of the hand. The secondary spark was found also to obey the same rotative or tangential action as the conductor itself. (Vol. 11, No. 33, page 191, March, 1851.)

Soon after the publication of these interesting results, M. Ruhmkorff, an instrument-maker in Paris, took up the induction apparatus with a view of increasing its electrostatic powers. Du Moncel, the author of a special treatise on the Ruhmkorff coil, says that "Ruhmkorff, profiting by the experiments and observations of Masson & Breguet, sought to provide for a better insulation of the wire of the secondary circuit, and to prevent the loss of static electricity;" and, to accomplish this, he "drowned" the wire in shellac. The fine wire coils were very long—in some cases even ten miles. He also increased the dimensions of the coil lengthwise, or in the direction of its axis, and diminished its tranverse diameter, in comparison with coils that had generally been made in Europe. In fact, they were made more according to the form of Prof. Page's coils. The terminals of the secondary wire were attached to glass pillars, and the circuit was broken by the McGauley circuit-breaker, heretofore described. With this apparatus, Ruhmkorff obtained sparks in air about one-eighth of an inch long, and very beautiful luminous effects in vacuo. Sparks could be taken from either extremity of the secondary wire alone, and the shocks were dangerous to encounter. Subsequently, Fizeau discovered that the connection of a condenser with the primary coil had the effect of suddenly arresting the secondary current of this coil, and to greatly increase the intensity of the current of the secondary wire. At his suggestion it was applied to the Ruhmkorff coil, and at once gave it a celebrity which, perhaps, otherwise it might not have attained. This coil was announced in this country, in *Silliman's Journal*, by Prof. J. Nicklès, in 1853 (vol. 15, page 114), and excited but little interest at the time. The editors of the *Journal* added, in a foot note to this communication, that "there were many points of resemblance between the apparatus of M. Ruhmkorff and the compound-magnet and electrotome of Dr. Page, whose apparatus appeared to be but little known in Europe." And, in reference to the circuit-breaker described by Nicklès, the editors said, that "this apparatus is very nearly indentical with the vibrating armature breakpiece of Dr. Page and Daniel Davis, for more than ten years in use in all the forms of electro-medical apparatus. The American contrivance has the additional convenience of an easy adjustment for the rapidity of its vibrations."

In the latter part of 1854 and beginning of 1855, Poggendorff published the results of his experiments with Ruhmkorff's coil, and suggested several modifications, none of which, however, seem to have been of much practical importance, except that of making the secondary coil, in several sections, to avoid the tendency of the intense current, to pass through from layer to layer of the wire, and injure the coil. This division, however, of an intensity coil was not new at this time, the same device having been patented in England by Edward and Charles Bright, October 21, 1852; No. of patent, 14,331. (See 14th claim.) It was applied to the coils of relay magnets, but for the same purpose and upon the same principle as Poggendorff's suggestion. In 1856 the coil began to make some stir and progress among electricians, and gave a new-impulse to the use of the induction coil. In 1853 Fizeau, while investigating the subject of induction, found great annoyance from the irregular action of the primary current. When the sparks of the circuit-breaker were brilliant, the intensity of the secondary was diminished, and when some obstruction occurred to diminish the sparks, the secondary was increased. The irregular action arose from the burning away of the points of contact by the primary or extra current. He sought, therefore, to diminish or absorb this current, by interposing a Leyden jar or a condenser. By connecting the plates of the condenser with each side of the interrupter or circuit-breaker, he found at once that the sparks were diminished, while those of the secondary circuit were doubled in length. (*Comptes Rendus*, vol. 36, p. 420, 1853.) He also suggested the convenience of placing the condenser beneath the machine, and alluded to the effect of a long fine wire in suppressing the extra current. Ruhmkorff soon applied Fizeau's condenser to his coils, and exalted the intensity of the secondary so as to increase the spark from one-eighth, or thereabouts, to a little over half an inch in length.

The only decided novelty of any particular value in the construction of the coil was made in this country by Mr. Edward S. Ritchie, of Boston, Mass., in 1852. In a letter from Mr. Ritchie to *Silliman's Journal*, dated Boston, May 2, 1857, he describes a coil with a peculiar mode of winding the wires of the secondary, by which he obtained six inches sparks. This letter was published in the September number of *London Ed. Phil. Mag.*, 1857, vol. 14, page 239.

In a subsequent letter to the editors of this magazine, Boston, October 2d, 1857, Mr. Ritchie states that he constructed a coil for Columbia College, New York, in July, 1857, which gave sparks "ten and a half inches long."

In *The Edinburgh New Philosophical Journal*, vol. 6, page 189, July, 1857, is a communication from Prof. William B. Rogers, describing one of Ritchie's coils, giving sparks six and a half inches long. He also describes the mode in which the secondary coil is made up of a succession of conical layers.

Mr. Ritchie's reputation soon became deservedly celebrated, and orders for his coils were received from Europe. Mr. Gassiot, of London, describes one in the *London Ed. Phil. Mag.* for May, 1858, page 446. This coil gave sparks of the enormous length of twelve and a quarter inches by accurate measurement, and Mr. Gassiot said he was confident it would give fifteen inches, but was afraid to force it too much, lest the insulation should be penetrated. Mr. Gassiot speaks of the coil as made up in sections, and that "the method of winding had been before suggested by Poggendorff." In this he was in error. Poggendorff suggested "dividing the coils lengthwise into several sections," and, to use his own language, "each section being wound up in the usual manner" of superposed layers. Mr. Ritchie's coil was, indeed, made of sections, but there were as many as spires of wire in the whole length of the instrument, and each of these was wound up, not in the usual way, but as a flat spiral. A sectional arrangement, which necessitated a new mode of winding and an entire change in the construction and power of the coil, is a very wide departure from Poggendorff's plan, or rather Messrs. Bright's plan. Thus we find that the commencement and perfection of the induction coil, which we shall hereafter characterize as the electrostatic coil, must be accredited as American inventions. Of this we shall speak further in another chapter. After Mr. Ritchie's invention was known in Europe, a new impulse was given to the subject, and coils of nearly equal power were brought out by Ruhmkorff and other instrument makers. A communication in the *Franklin Journal* of 1862, vol. 73, page 58, shows the manner in which M. Ruhmkorff became acquainted with Mr. Ritchie's improvements, and his previous refusal to accept a challenge to furnish a coil equal in length of spark to Mr. Ritchie's. In the application of Fizeau's condenser, we recognize a discovery and invention of high value and interest, which will abide as a monument of his learning and genius. Latterly, we have heard of coils giving sparks "two feet long," from coils eighty miles in length. (*Noad's Inductorium*, London, 1866, page 42.)*

Adjourned.

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* We have annexed illustrations of the principal apparatus alluded to in Prof. Page's article, several of which were not described by reference to the engravings.

## April 23, 1868.

Prof. S. D. TILLMAN in the chair.

The meeting was opened by the presentation from the chair of the following notes on new discoveries and inventions:

### IMPROVEMENT IN MAKING GLASS.

The changes of various kinds which glass undergoes have recently been subjects of considerable discussion. Some varieties of glass cannot be perfectly cleaned, owing to its hygroscopic nature and the tendency of this silicious compound to decomposition. The pure white unalterable Bohemian glass is a silicate of lime and potash, but it is very infusible and difficult to work. Taking advantage of the well-known fact that a mixture of the carbonates of potash and soda fuses at a lower temperature than either salt alone, Prof. Stas substitutes such a mixture for the potash, and thereby obtains a glass as unalterable as the Bohemian variety, but much more fusible.

### COLORED INKS.

Fuchs's method of making colored inks is to digest for three hours a quarter of an ounce of aniline, of the color desired, with two ounces and a half of alcohol; then to add a pint and a half of water, and heat the whole gently until all the alcohol is driven off, after which one ounce of gum arabic dissolved in eight ounces of water is added. The solution is allowed to stand until the impurities have settled, and it is then ready for use.

### VALUABLE CEMENT.

Dr. Tollens mixes equal weights of oxyd of zinc (commercial zinc white) and very fine sand, to which is added a solution of chloride of zinc, having a density of 1.26. The paste thus formed sets rapidly and resists the action of most acids. American dentists have employed for many years the same paste, substituting powdered quartz for sand. This paste, however, does not resist the action of the saliva of the mouth for any great length of time.

### ORNAMENTED PAPER.

Puscher's process for ornamenting paper with silky crystals is to mix the gum made by heating commercial starch to 320 degrees Fahrenheit, known as British gum, with equal parts of Epsom salts and of water, to which is added a small quantity of glycerine. After being brought to the boiling state the mixture is immediately strained. While yet warm it is spread with a camel's hair brush upon paper previously coated with a thin solution of glue or gelatine. The paper, on being dried, presents a beautiful crystaline surface. The size of the crystals may be varied by altering the strength of the solution, and by drying the paper more or less rapidly. Crystals of different tints may be made by mixing analine colors with the solution, and preparing the paper with the white of eggs instead of gelatine.

### NEW ALLOYS OF LEAD AND TIN.

M. Plho describes two new alloys containing less tin than ordinary pewter, which are not acted upon by boiling acetic acid or by salt water, and may therefore be used for some kinds of utensils. The first alloy contains 1 part of tin and 2.4 parts of lead. It has a density of 9.64 and melts at 320 degrees Fahrenheit. It is made by first melting the lead, and, after skimming it, gradually adding the tin; by stirring it constantly with a wooden stick in the mean time, the lead is prevented from settling to the bottom. The second alloy consists of 1 part of tin with 1.25 of lead. It is less malleable and more brittle than the first.

### THE COMING ECLIPSE.

Both English and French astronomers are making preparations for observing at the East an eclipse of the sun on the 18th of August next, which will be total for the space of six minutes forty-six seconds along a line passing through Southern New-Guinea, Hindostan, the Bay of Bengal, the Malayan Peninsula, and the Gulf of Siam. Leverrier recommends that the French ships be placed on the eastern side of the Malayan peninsula for the accommodation of the observers. Some interesting questions regarding the "corona" and "red flames," it is hoped, will then be satisfactorily settled by means of the spectroscope.

### ANOTHER ASTEROID.

On the 17th of February, M. Borelly of the Observatory at Marseilles, France, discovered a telescopic planet, which is the 96th of those now known, having orbits between Mars and Jupiter. Three nights later it was observed by M. Loewy with the great meridian instrument at Paris.

### CURE FOR THE CATTLE PLAGUE.

Chloride of copper is now extensively used in Germany against the cattle plague. The practice is to dissolve eight grammes of crystalized chloride of copper in two kilogrammes of alcohol, and with this solution to wet a pad of cotton, which is then laid on a plate and burned in the center of a stable, the heads of the animals being turned toward the plate so as to breathe the fumes. This operation is performed morning and evening; one pad is burned for every three head of cattle. The solution is also administered internally, with the addition of fifteen grammes of chloroform for the above named quantity. A teaspoonful of this liquid is mixed with each animal's drink three times a day.

### ELECTRICITY ON MOUNTAINS.

The *Bibliothèque Universelle* contains a paper by Henri de Saussure, describing some interesting phenomena observed by a party of tourists on the summit of Piz Surley, a mountain composed of crystaline rocks, in the Grisons, at an elevation of over 10,000 feet. The party had just laid their albenstocks against a pile of dry stones which crowns the summit, and were preparing to take their repast, when M. Saussure suddenly felt pains and pricking sensations on various parts of his body, which soon assumed the character of a burn. At the same time a sound something like the vibrations of a tuning-fork came from the sticks resting against the stones. They vibrated strongly in the hand but gave no sparks. Mr. Saussure felt his hair and beard stand out, and a young Frenchman of the party declared that he could feel his moustache growing, and strong currents passing from the tips of his ears. The sensation of flowing currents was experienced by all present, and was evidently the result of electricity passing from the summit of the mountain. As they descended these phenomena diminished, and eventually ceased. The sky was cloudy, and the travelers were overtaken by a storm of hail and sleet before completing their descent.

### BRONZE POWDERS.

According to Dr. Wagner, of Germany, the usual bronze colors are really metallic. The metals employed are for the most part, copper and zinc, which are made into an alloy and then reduced into an impalpable powder. The first and most common method of obtaining the powder is to beat the alloy into thin leaves, which are rubbed with a scratch brush through an iron sieve. After being ground with oil, the powder is heated until the required tint is produced. The alloy may be reduced by filing, and the sharp angular particles thus formed are flattened by rollers. Dr. Wagner has made a good bronze by passing over highly heated oxyd of copper the vapor of the petroleum product known as Rhigolene, sixteen pounds of which will reduce two hundred pounds of copper. After being allowed to cool in the same vapor it is lamellated in a mortar. Various shades may be given to this powder by means of the vapor of zinc or cadmium. If the oil used in reducing the oxyd contains a little sulphur, beautiful variegated colors will be produced. The proportions of the metals ordinarily used are, for a bright yellow, eighty-three parts of copper and seventeen of zinc; for an orange, from ninety to ninety-four of copper, and from six to ten of zinc. A red bronze is composed entirely of copper.

### COTTON WAX.

Mr. E. Schunck, in a paper read before the Manchester Literary and Philosophical Society, "on some of the constituents of cotton fiber," describes the organic substances obtained by him from unspun cotton yarn, the most interesting of which was a waxy matter, insoluble in water, but soluble in ether and alcohol. If a concentrated solution in boiling alcohol be allowed to cool, the greatest part is deposited, causing the liquid to assume the appearance of a thick white jelly, consisting of microscopic needles or scales. When this jelly is filtered off and dried, it shrinks very much, and is converted into a coherent cake, which has a waxy luster, and is translucent, friable, and lighter than water. Its melting point is between eighty-three degrees and eighty-four degrees C. At a higher temperature it is volatilized. When heated on platinum, it burns with a bright flame. The author thinks it probable that this substance covers the cotton fibers with a thin, waxy film, and this imparts to them their well known property of resisting water. In its properties and composition it approaches very nearly the vegetable waxes, such as those found on the leaves of the sugar cane, and of the carnauba palm. He proposed the name of cotton wax to distinguish it from other nearly allied bodies.

### PLEURO-PNEUMONIA.

Many of the leading farmers in French Flanders have checked the inroads of this formidable cattle disease by inoculation. M. Barral visited the prize farm of M. Fiévet, of Masny, who yearly fattens nearly five hundred cows, in sheds containing two hundred stalls, their feed being chiefly mangold refuse from beet sugar works and distilleries, and observed the operation of inoculation;

as performed by Dr. Willems. After cutting off the hair of the lower end of the tail, three or four incisions are made, and a small quantity of virus is inserted. This virus is the liquid extracted from the lung (not too much decomposed) of an animal that has been killed under an attack of pleuro-pneumonia. At the end of about three weeks a series of symptoms are manifested. They consist, for the most part, of certain pustules on the incisions, which heal of their own accord. In other cases the extremity of the tail swells, and exhibits a sort of gangrene, which is arrested by cutting the tail above the wound. M. Barral counted two such cases out of one hundred and sixty-two animals inoculated at the time of his visit. In a few cases the inflammation extends to the upper part of the tail and the flesh adjacent to the point of attachment. Upon the appearance of mortification, the veterinary performs an operation for the removal of the decomposed flesh, and the wounded parts are then washed with a jet of fresh water, passing through an India-rubber tube. This produces excellent results, except in winter. Experience has shown that where inoculation is practiced, the loss of animals in the infected districts does not exceed one or two per cent.

## VOLCANIC CONES.

The two most remarkable volcanic peaks known are on Unimak Island, the most eastern of the Aleutian group in the Pacific. They rise from the sea in perfect symmetry to the height of nearly ten thousand feet. Between them is Destruction Peak, which, by an eruption in 1863, destroyed many lives.

## VIOLIN AND HARP STRINGS.

The Neapolitan provinces still maintain their superiority in the manufacture of musical strings. Neapolitan sheep being generally small and lean, are said to afford the best quality of raw material. Strings are made from the small intestines, which are first thoroughly cleaned and scraped, and then steeped for four or five days in alkaline lye, containing a little alum, when they are found to be bleached and swollen. They are smoothed by being drawn through a ring, and after being dried, are twisted and sulphured. Sometimes the sulphuring process is applied before they are dried, and they are often polished by means of horse-hair cords. Strings have been manufactured in Italy since their first use on modern musical instruments, and have always been noted for their strength, clearness and brilliancy of tone.

A discussion followed the reading of these items. That on "New Alloys of Lead and Tin" drew forth Dr. Vanderweyde, who described the method of making the tin-foil, now in common use, by rolling a thin plate of lead between two thinner plates of block-tin, the resulting product being, in reality, lead-foil covered with tin. He mentioned instances of lead poisoning on the part of tobacco chewers, who had chewed with the tobacco the foil employed to enwrap the same. It was also mentioned that the gilt wire used in the manufacture of epaulets, etc., is made in a manner somewhat similar to that of making foil. A coarse wire is first heavily gilded, and afterwards drawn down to the requisite degree of fineness.

Dr. W. Rowell stated that the method now used for tinning the internal surfaces of electrotype plates, as required previous to backing them with the ordinary filling of type metal, is to place tin-foil thereon, which, being melted readily, adheres, thus securing the object sought. After some further discussion of other items, new inventions were exhibited.

## *NEW METHOD OF SETTING WINDOW GLASS.*

Mr. J. R. Eddowes, of Philadelphia, exhibited specimen of windows, in which the glass was set and secured in the sash by his new method. He remarked that putty is so generally used for confining and securing glass in windows, that it would almost seem superfluous to advocate the employment of any substitute, yet it is well known that this means of confining glass in place has its disadvantages, inasmuch as the action of the elements will in time cause the putty to become loosened, and its renewal is then necessary. If at any time before this detriment to the fastening takes place, a pane of glass becomes injured or broken, and it is deemed advisable to remove it, it is sometimes difficult so to do, and much injury may result to the sash in which the pane was held.

The model shows the pane of glass inserted in a suitable rabbet in the sash, and fitted at each side of the inner circumference of the sash or frame, and over the edges of the glass is a clamping plate, and furnished with flat lugs, through which screws are inserted for the purpose of holding this clamp to the sash. Placed between the clamping-plates and the sash is a packing, which may be made of a tube of rubber or any similar packing material, which, being snugly compressed between the plate and the glass, effectually holds the latter in place, and from its yielding nature allows the edges of the glass to be more underneath the frame, and enables the glass to expand or contract with the changes of temperature, without any liability of breaking, which is often the case when the edges of large plates are rigidly confined. There is a cushion of rubber or other soft material upon which, in case of large panes, the glass rests. To allow for any inaccuracies which there may be in the glass, where it would otherwise come in contact with the sash, a lining of cork or other elastic material is placed in the rebate before the glass is inserted.

To provide for the various sizes of panes of glass, and at the same time form a neat miter at the corners, the greater portion of the length of each side, and also the ends, is composed of a strip, and a separate piece forms the corner and miter entire, and extends a little distance to meet the side and end pieces, and where these pieces meet, a little projection laps over the other piece, making a protected joint, and at the same time covering the unsightly appearance of the two clamps where they join, which otherwise would present an open joint.

A combined cultivator and harrow was then exhibited, which is the same as that described before the Farmers' Club (see page 552).

## *BIOMETRY.*

Dr. T. S. Lambert then addressed the meeting on the measure of life, for which he proposed the name Biometry, the science of life being designated now by the word Biology. He maintained that a person could not prolong his life but little beyond that of the average length of his ancestors' lives, and said there were certain signs of longevity, such as the hazel eye and the long body, which he had found by observation to be true. His business, that of life insurance, had led him to investigate the subject in all its bearings. However, the indications of longevity were not stated by the speaker in such form as to admit of their being briefly reported. His address was interspersed with many very appropriate and amusing anecdotes.

## *MAGNETISM*

Prof. Vanderweyde resumed the subject on which he spoke at the last meeting. The principal point of novelty was the curious relation which seemed to exist, with very few exceptions, between the specific gravity and automic weight of those elementary substances which have magnetic properties. At the conclusion of the remarks on magnetism, the Association adjourned.

## April 30, 1868.

Professor S. D. TILLMAN in the chair.

The following papers on science were presented by the Chairman:

### AMBER.

This fossil substance is supposed to be the product of extinct coniferæ. It resembles the resins, and is sometimes found on fossil wood, and inclosing the cones and leaves of the tree called by Göppert, *Pinites Succinifer.* Insects which inhabited the ancient forests have been found embalmed in it. The electric properties of amber are well known. The Greeks called it "*elektron*," from which is derived the word "electricity." Amber is brittle and tasteless; it is a little heavier than water, generally of a whitish or light yellow color, and often transparent. The exact constituents of amber have not yet been ascertained. It is a mixture of resins, succinic acid and a volatile oil, containing several hydrocarbons. After a treatment with ether, the insoluble part is said to have the same composition as camphor. Amber may be dissolved by pure alkalis and by sulphuric acid. When it is subjected to fuming nitric acid, "artificial musk" is formed. Amber is now in great demand for mouth-pieces of smoking pipes, and various imitations have been devised. The substances most resembling it are "honeystone" (mellitite of alumina) and copal resin. From these it may be readily distinguished by means of heat. Honeystone is infusible; copal takes fire and melts by drops, while amber burns with a fitful flame. The largest specimen of amber known weighs eighteen pounds, and is deposited in the Royal Cabinet of Berlin. Amber is found in various parts of the world, but the chief supply is now from Northeastern Prussia, on the coast of the Baltic sea, where it is washed out of the bluffs, and is generally found after a storm. Prof. G. Zaddach, of the University of Köningsberg, has described in *The Quarterly Journal of Science* the geological formations of the amber region called Samland, lying northwest of Köningsberg, from which we gather the following information: "The blue earth" or "amber earth" on the west lies on the level of the sea, under deep beds of a green sand of the tertiary formation, the stratum of amber earth being only three or four feet thick; in other places it reaches a thickness of eight feet. The amber occupies only a narrow zone in the whole formation; in this indeed it occurs abundantly, but is not equally distributed. For each square foot of the surface of the bed—that is, one cubic foot of sand—from one-half to one pound of amber may be reckoned as about the average. The pieces are of various sizes, those weighing as much as a half pound being seldom found, and larger lumps of one or more pounds are extremely rare. Their surfaces are dull and worn, and their edges and angles are somewhat rounded, but not to a sufficient extent to obliterate the various forms which they originally received as the liquid resin of a tree, such as pins, drops, and plates, which were formed between the bark and the wood, or between yearly rings of growth of the stem. Frequently, also, fine impressions of the parts of the plants which produced them can be distinguished on their surfaces. It follows, therefore, that the pieces of amber were for some time, but not very long, rolled about by the water previous to their deposition. With the amber also occurs fossil wood, but generally only in small pieces, which were probably half-decayed when they were deposited. The complete system of a tree has never yet been found in the amber earth, and solid pieces of a foot or more in length are very rare. Such pieces of wood as still have amber attached to them are of especial interest, and there are even some so completely penetrated with amber-resin that they appear to consist, not so much of wood-fibers as of amber-filaments. In the "amber-earth" and in the lower part of the "quick-sand" just above it there also occur pieces of compact clay and marl which contain numerous fossils, the same as those which are found in the overlying ferruginous sandstone. The amber-earth by no means lies in its original bed—that is, not in the soil of the old forest in which the amber-pines grew; the whole deposit of the "glauconitic sand" is a marine formation, and the amber was washed into it by the sea in which crabs, sea-urchins, and oysters lived. From the habits of these animals, and from the form of the pieces of amber, it may be inferred that the deposition of the latter occured not very far from the shore; and from the condition of the amber, that its disposition took place in a proportionately short time, and that considerable stores of it must have been collected in neighboring localities. In the beds above and below the "amber-earth" only a few isolated pieces of amber occur. Through alternate upheavals and depressions the land has gradually risen to the height it now possesses; but the waves of the sea still continue their work of destruction which they commenced thousands of years ago, and yearly lessen the area of the country. If, however, other countries can only complain of the damage which the sea has inflicted on their coasts, it here amply repays the loss it has caused. When lashed by the storms, it tears up the amber out of the deep-lying beds of amber-earth; by the help of the sea-weeds torn up at the same time from the beds of the sea the amber is heaved upward, and carried to the surface of the water; and when the storm abates and the sea becomes calm, it carries the amber, together with pieces of older brown coal and fresh marine plants, on to the beach, where a hundred hands are wating to intercept it with nets. That is the "amber-drawing," a trying occupation, which demands a strong and hardy frame, for the cold winter storms yield the richest booty. But many pieces of amber, nevertheless, do not reach the shore, for the largest and heaviest pieces have already sunk to the bottom, and lie between the large boulders which cover the sea-bed. Therefore, in calm weather, and with clear water, the inhabitants of the coast go in boats, and turning the stones with hooks fastened on long poles, endeavor to discover the amber in the interspaces, and to draw it up with small nets. This is called "striking for amber." For a long time people were contented with whatever amber they could recover by this means from the sea, and these modes of acquisition still furnish the greatest quantity of the amber which is obtained from Samland for commerce. For the last ten years, however, on all points of the coast where amber-earth does not lie too deep beneath the sea-level, endeavors have been made to lay it bare and obtain the amber immediately from it. The circumstance that it is overlain by a bed of very loose sand, which contains a large quantity of water, has hitherto impeded the attempts to open out the amber-earth by subterranean mining-works. And to make this possible, and therefore to render accessible the stores of amber which lies hidden in the interior of the country, will be the next progress in the acquisition of these, in so many respects, remarkable fossils.

## *THE NEW CHEMICAL NOMENCLATURE*

By Samuel D. Tillman.

The new Chemical Nomenclature was first printed in the Transactions of the American Institute for 1865–6. A few copies were at the same time put in pamphlet form, and sent to the leading chemists of this country and Europe. The London *Chemical News* of March 1st, 1867, reviewed the work, and, as was expected, opposed its adoption for the following reasons:

"1st. It is founded on shifting theories, *i. e.*, of complex organic nomenclature. 2d. The tendencies of theoretical chemistry are in a totally different direction—to a mathematical, not mnemonic, expression of facts. 3d. The chemistry of the old authors would be more than ever unavailable. 4th. The present rooted stage of chemistry will not allow a total revolution. 5th. A universal adoption, all but unattainable, is absolutely necessary for its success. 6th. Chemists would not only have to learn something fresh, but to unlearn all they know, in so far as the words express facts, not the facts themselves. 7th. It is, as the author states, a short-hand, and we should immediately have A's, B's and C's, systems also."

Without attempting the very easy task of answering such objections, nearly all of which might be brought against every improvement of a like character, however important, I will only add another extract from the same article in the *Chemical News*, as to the real merit of my work:

"It is, indeed, proper to say, that the author has proved 'the copiousness and capacity' of the new scheme, and we owe it to him, in the barest justice, to say, that the scheme, as a mnemonic scheme, seems perfect; and that it is not more complex than such a scheme of necessity must be. The work has had bestowed upon it the greatest labor, thought and knowledge; and whether it be adopted or not, the thanks of the chemical world are due to Mr. Tillman, whatever its verdict may be, for giving them the opportunity of forming a correct judgment on the feasibility of any such scheme."

An error in the text, as to the date of the author's invention (which should have been 1845 instead of 1850, and which was correctly given in the official copy of the Proceedings of the American Association for the Advancement of Science), brought out a communication in the *Chemical News* of April 10, 1867, questioning its originality. This movement was most opportune, for it prompted me to collect testimony which I might not have been able to obtain at a later period. In looking for evidence of the priority of my invention, I called on Prof. C. A. Joy, of Columbia College, and was delighted to find he had kept a diary, on referring to which, he was enabled to fix the day I explained my new system to him. I had time to obtain the statement of only one other well-known gentleman, before sending to the London *Chemical News* the following communication, which appeared on the 7th of June, 1867:

"*To the Editor of the Chemical News:*

"Sir—Permit me to rectify a statement made by a correspondent, on page 200, No. 285 of the *Chemical News*. Gmelin did not publish any new plan for a chemical nomenclature in the year 1827.

At that time Laurent was still at school, and Dumas had not yet made the discoveries on which the doctrine of substitution was based. However, in the next 'generation' (1848), a chapter on that subject appeared, for the first time, in the fourth edition of Gmelin's *Handbook of Chemistry.* In the English translation of that work, this chapter, entitled 'Suggestions of a New Chemical Nomenclature, particularly for Organic Compounds,' occupies just four pages (vol. vii, pp. 149–153). The article, by its allusions to recently discovered compounds and new chemical reactions, bears internal evidence that it was written immediately prior to its publication in 1848. Long anterior to this date, I had conceived the idea which was the germ of my own scheme. In 1850, I extended the system of counting, so as to express the highest combinations. My first promulgation can be proved by the following statements by well-known scientists:

"'On consulting my diary, I find that the time you explained your new chemical nomenclature to me, in which you proposed to use vowels as numerals, and to distinguish the non-metallic elements by different consonant terminals, was on Saturday, May 13, 1848. * * * This is no occasion on which to offer a criticism of your nomenclature, but I cannot refrain from adding my testimonial to its wonderful adaptation to the simplest expression of the most complex chemical compounds.

"CHARLES A. JOY,
"'*Professor of Chemistry in Columbia College
and in the School of Mines, N. Y.*'

"'For several years (preceding 1846) Prof. S. D. Tillman and I resided in the same town. I well remember his plan, then and there made, of a new chemical nomenclature, in which the name of a new compound denoted its exact component parts. The number of equivalents was expressed by a vowel immediately preceding the last letter (m) in the names of all metals, as well as before the different consonants expressing non-metallic elements.

"'EDWARD BAYARD, M. D.,
"'*No. 6, West Fourteenth street, New York.*

"The question of priority of conception will be deemed of minor importance by those who have carefully examined what has been done by Gmelin and by me. That Gmelin did not "fully elaborate" his scheme, is evident from his own admissions. In the chapter alluded to (page 151, Watts' translation 1859), he says: 'In working out the details of this nomenclature, it would doubtless be found that many additions and corrections would be necessary. * * * In a nomenclature for organic compounds something more is required than the name of elements and the expression of their number by vowels.' This author gave new names to all the elements, yet failed to express any but the simplest facts of combination. After devising a very defective numerical system, in which the value of vowels depended on their position, he was compelled to coin new words for each nucleus, having no reference to their composition, thus virtually abandoning the vowel plan.

"By scrutinizing Gmelin's method, any one who comprehends the requirements of a complete nomenclature, will be convinced that the scheme cannot be used as a substitute for the notation. Similar objections may be made to Mansfield's method (see *Theory of Salts*, London, 1865). This author shows that the use of the five vowels as numerals was of English origin, and was employed, although not in connection with chemistry, in Dr. R. Gray's *Memoria Technica* (new edition, Oxford, 1831).

"I claim for my scheme,—which is adapted to Gerhardt's unitary system, and may properly be called "the unitary nomenclature"—as its chief merit, simplicity of construction. Accepting the old names of the elements, I have so modified them that each begins with its old symbol and ends with its new; the latter so generally corresponds with the former that only seven new characters are introduced. With these materials, and a more perfect numerical method than that employed by Gmelin, I have succeeded in representing, by a combination of letters and syllables, bodies of the most intricate structure. For the first time systematic terms have been applied to radicals, so-called residues, and their numerous combinations. Every hydrocarbon has an appropriate symbolic appellation, and not only polymers but isomers have distinctive names. The only paper which I have yet published on the subject contains word-formulæ for more than *seven thousand compounds.*

"Although the unitary nomenclature is commensurate with all possible atomic combinations, I do not claim that the new names would be preferable to a portion of the corresponding names now employed, nor do I entertain the hope that any part of the new scheme will be adopted until combinations of terms on the old plan become too cumbersome for common use.

"I am, &c., "SAMUEL D. TILLMAN.

"AMERICAN INSTITUTE, NEW YORK, *May* 11, 1867."

Since the above was written, I have received a number of letters from teachers of science who early listened to my explanation of the new system. One from Professor O. Root, of Hamilton College, who remembers my conversation with him on the subject a year before the date first given. Another from Mr. C. M. Crittenden, Principal of the Seneca Falls Academy in 1844, inclosing one from Mrs. Crittenden, who fixes that year as commencement of my attempt to devise a new chemical nomenclature. Mrs. Elizabeth Cady Stanton, the distinguished philanthropist, remembers my explanation of it to her in the year 1846. The following certificate from a well known public lecturer, will suffice:

"In the year 1845, I gave my first course of lectures on electro-magnetism at Seneca Falls, N. Y. I there met Samuel D. Tillman, who was then in the practice of the law, but spent much of his time in scientific investigations. Among the new inventions he showed me was his plan of a chemical nomenclature in which, by the use of vowels to represent the number of equivalents, and consonants to represent the elements, he formed new names for chemical compounds which severally expressed their exact composition. Since that time he has greatly improved and extended his nomenclature by adapting it to the new notation now adopted by advanced chemists. What I then saw was the germ of the system which he has since so successfully developed.

"JOHN F. BOYNTON, M. D.,
"*Lecturer on the Physical Sciences.*"

It seems proper to notice here more in detail what was actually done by the authors who were among the first in Europe to direct their attention to the question of a reform in chemical nomenclature.

Laurent, in his *Chemical Method*, takes up the subject of nomenclature. In Odling's translation of that work, published at London, by the Cavendish Society, in 1855, page 37, under the title of nomenclature, the author says: "We conclude our explanation at this point by saying that we have not any systematic nomenclature for the designation of organic substances. Nevertheless, I ought not to pass over in silence the very remarkable nomenclature which has been published by Gmelin, and which enables us, from the name of a body, to determine its composition; and reciprocally, from its composition to determine its name.

"Dumas had conceived the idea of representing the number of the atoms of chlorine which entered into a combination, by means of the vowels *a*, *e*, *i*, *o* and *u*, equal to 1, 2, 3, 4 and 5, respectively. In following out this primary idea, I had endeavored to frame a nomenclature in which the names employed should indicate the composition of the bodies. I obtained in this manner, ethene, chloresthase, chloresthese, chloride of chloresthase, ethum, oxide of ethene, ethous acid, ethic acid, chlorethisic acid, &c., which are undoubtedly quite as convenient as the corresponding names, bicarburetted hydrogen, chloride of aldehydene, aldehydic acid, chloracetic acid, &c.

"Nevertheless I arrived, unfortunately, at several names of the following description: amachlorephemusic acid, sulfindate of sulfechlorindilum, chloré-illose, &c., which although not more barbarous than the hypersulphomolybdate of potash, or the susphorrinidinous subhypochlorite, had not any chance of being accepted by chemists.

"The nomenclature of Gmelin has certain analogies with mine, inasmuch as the letters which compose names have a numerical value; but these letters have another advantage, namely, that of designating the actual substances which enter into each combination. Here, again, and even to a greater degree than in my system, do we arrive at names so extraordinary, that notwithstanding their brevity, they have not any chance of being adopted."

It is quite evident from this quotation that Laurent did not produce any feasible system of names. The peculiar feature in Gmelin's plan which he did not and could not elaborate, but which was thus commended by Laurent, originated with me, and was used here several years before its publication in Europe. Furthermore, I have avoided the errors made by Gmelin in the outset, and which prevented him from applying his proposed system even to the more important chemical compounds. Gmelin having made certain consonants represent certain elements, should not have used those consonants except for that purpose. Introducing new names into organic chemistry without regard to this cardinal point, increased its complexity; and the author, foreseeing that the result would be a jargon, wisely abandoned his scheme. In my new names for organic compounds and for all combinations of non-metallic elements, each vowel and consonant has a definite and invariable meaning. Using the well known names of the metals abbreviated so as to form a word of only two syllables, enabled me to combine them with non-metallic elements in an intelligible manner. The compound indicated was thus designated by a single word. In a few cases where two or more metals were found in the same body, a compound word, not quite so euphonious, was the necessary result. This may be illustrated by giving the new name for one of the bodies alluded to above by Laurent, the hypersulphomolybdate of potash. The absurdity of the present nomenclature is seen in this one word, for the compound contains no oxygen, although potash means the oxide of potassium and the molybdic acid contains three atoms of oxygen to one of molybdenum. Now by representing an atom of the metal potassium by *potam*, and of the metal molybdenum by *molam*, and of sulphur by its present symbol, *S*, we easily combine them to represent the actual composition of the first mentioned body.

The sulphomolybdate of potash results from a combination of the sulphide of potassium, which, by the new notation now generally used, is regarded as two atoms of potassium with one of sulphur, with the tersulphide of molybdenum, which is one atom of the metal with three atoms of sulphur; therefore the whole compound contains two atoms of potassium, one of molydenum, and four of sulphur, which is fully expressed in the new nomenclature, by *potem-molamos.* The hypersulphomolybdate of potash contains the sulphide of potassium and three atomoids of the tersulphide of molybdenum, making a total of two atoms of potassium, three of molybdenum, and ten of sulphur, which is shown by its new name, *potem-molimeus.* This compound is regarded as a combination of *potemas* with *molimeos;* but, as we know nothing of the actual internal arrangement of atoms in any chemical body, it seems more consistent to merely express the fact of the presence of the precise proportion of each element found in combination. For the same reason, salts are not represented in my system as the union of an acid with a base; therefore, protosulphate of iron, for example, is designated by *fermasot.*

It is certainly gratifying to discover, after years of devotion to the subject, that those great masters, Gmelin, Laurent and Dumas, had made attempts in the same direction. That I have succeeded in applying to several thousand chemical compounds new and euphonious names, which express, respectively, their exact composition as well as other prominent characteristics of each, thus forming the only complete and consistent nomenclature yet produced, is owing to the fact that I have taken advantage of the latest views of our foremost chemists, and have rejected all attempts to express by notation the supposed internal structure of a chemical body.

### *GLOBE TIME-PIECE.*

The first new invention exhibited was Timby's library globe time-piece. This beautiful piece of mechanism is of black walnut, arranged for the bracket, and every care has been taken to make it a first class time-piece. It gives true time and equatorial time. It illustrates time, and the method of measuring time. It illustrates morning and evening, day and night, and the earth's relative position to the sun. It enables a child, from observation, to become familiar with the geography of the globe, even before reaching the age at which children are put to such studies; or, in other words, it is a self-teacher of geography. It exhibits the diurnal revolution of the earth on its axis. It is a miniature world or model of the earth, put in motion, making a revolution once in twenty-four hours, moved by a superior time movement, requiring to be wound up once in eight days. It is thoroughly regulated by the manufacturer, and, like all good time-pieces, should not be unnecessarily or carelessly handled. As a piece of ornamental furniture, it has no superior. The dial, marked for twenty-four hours—twelve, twice repeated—encircles the globe, and revolves with it once each day. Only a section of the dial is exposed to view, where it passes under the stationary index (which points the time), the balance being covered by the case.

### *STOCK QUOTATION INDICATOR.*

Dr. L. Bradley exhibited and explained S. S. Law's gold and stock indicator. which is placed in the office of any broker, and gives him a complete report of sales at the stock board. Any number of machines may be operated by the main battery at the stock board. The electro-magnets at each office are made to turn discs on which are the numerals. All the machines are operated by the reporter at the board, in the same way that one telegrapher may send his communications to a hundred different stations at the same time. The invention is a great success, and is in very general use already in this city.

### *VALVE-REFITTING MACHINE.*

The invention exhibited by Mr. Hall renews worn-out valves through the agency of cutting tools and without the use of emery. The proprietors claim that it repairs valves without their detachment from connecting pipes; that there is a saving of time and money by the use of this portable tool. The instrument drew out remarks from Dr. W. Rowell, Mr. C. E. Emery, Mr. Fisher and others.

Several other inventions were exhibited. Pratt's adjustable scrubbing brush attracted the special attention of the ladies present, and seemed to meet with their decided approval. Sogg's sash-stop and fastener; and Sogg's combined hoe and corn planter, the peculiarity of which was the hollow handle of the hoe through which seeds passed from a small box on the end of the handle and dropped on the ground at the right time and place.

## *THE TIBIA OF AN ELEPHANT.*

Dr. D. D. Parmelee sent to the Chairman the following communication:

"The bearer of this brings to you and the Polytechnic Association, a fossil which is supposed to be part of a mammoth, or mastodon. It was found about half a mile north by east from the landing, on this side of the river, of the Thirty-fourth street, New York, ferry boats, and four hundred yards from the natural shore—*i. e.*, what would be the natural shore but for recent improvements—of the East river; eight feet below low water mark, and thirteen feet below the surface of what are called the Meadows, separating Hunter's Point (now called Long Island City) from Ravenswood; an alluvial deposit varying from one-sixteenth of a mile to one-quarter, or more, of a mile in width. The fossil was dredged up while forming a canal along which docks have recently been completed by the Union College estate, under the direction of Mr. H. N. Anable, for the accommodation of vessels carrying freight for the various industrial operations carried on in the vicinity.

"The fossil is now in the possession of Cornelius Reynolds, Esq., who resides near the locality where it was found, and who presents this letter to you."

This bone, which proved to be a tibia, or large bone of an elephant's leg, excited great interest, and was subsequently made the subject of an interesting lecture before the Institute, by Mr. Waterhouse Hawkins. No other parts of the skeleton have been found in the locality mentioned.

## *ON A NATIONAL SCHOOL OF MINES.*

The greater part of the evening was devoted to the address of Mr. Rossiter W. Raymond, U. S. Commissioner of Mining Statistics and editor of the *American Mining Journal.*

He considered first, the nature of mining industry, and its relations to civilization, and pointed out the distinction between mining and agriculture, in that the former was characterized mainly by greater permanence of product, but less permanence of production, while the latter was a constant stream of perishable wealth from an inexhaustible source. Soils, even forests, may be recuperated and restored after the most wasteful treatment; but mineral deposits, once exhausted by legitimate labor, or ruined by wanton extravagance or ignorance, are lost. This distinction bears directly on the history of nations. The approaching exhaustion of many local sources of mineral wealth, in England and on the continent, was adduced in illustration. Regarding themselves as guardians of the treasures of the soil, and mindful of the fact that the consumption of such wealth is a constant drain upon the capital as well as income, most governments have claimed over mineral deposits, especially those of the precious metals, a right of control. They have raised from them revenue for the state, and prevented their injury and destruction by private citizens, recklessly hasty to be rich. Our American democracy does not favor governmental interferences of any kind, and although in obedience to the traditions of statesmanship our government has hitherto maintained in theory its supreme right over the minerals in its territory, the claim has never been enforced in practice. Nor is it necessary to imitate the despotisms of Europe. Gold and silver mining were then discussed, and declared to be not theoretically but practically and economically (owing to peculiar circumstances) the most difficult branch of the art in this country. The special relations of bullion to money, commerce and government, and to all forms of industry, were explained, and the speaker showed by a forcible argument, which won repeated interruptions of applause, that the mining industry of the Far West has been the motive power of a vast national progress, and that, even if every dollar of gold and silver produced has been obtained at undue expense, the great balance of national advantage would be in favor of the pioneer industry which has laid open half the continent, and established the already vast agriculture of California and the rising commerce of the Pacific.

This interest has therefore peculiar claims upon the protection of Government. Now what shall be the nature of that protection? The production of bullion is decreasing. What can be done to raise it again? What are the crying necessities of the mining community? The speaker claimed that two main points covered the case. Secure titles and the diffusion of proper information would increase the profits and reduce the wastes of mining in this country. He then discussed the means to be employed in attaining these ends, and in relation to the second one, remarked that a national school of mines is a great necessity, and gave his reason why the proposed institution should be a school and not a bureau; a school of mines and not of general science, with mining as a subordinate branch, and a national, not a state or private school. In the course of these remarks, Mr. Raymond spoke in highly complimentary terms of the Mining School of Columbia College, but said one might as well refer a citizen of California or Idaho to Berlin as New York for his education; and, moreover, to realize the utmost possible benefit from its influence, a mining school should be located in a mining community. Considering the objections frequently urged against science and theorists by so-called practical men, he showed that the establishment of a national school, in this country would obviate the evil, the existence of which he frankly admitted, and the nature of which he believed to lie in training men to a particular profession thousands of miles from the place in which they were to practice it and under widely different conditions. Mr. Raymond spoke for about an our and a half, and was listened to with the closest attention by a crowded and highly interested audience. Adjourned.

# PHOTOGRAPHICAL SECTION.

## ORIGIN.

On the 26th day of February, 1859, a preliminary meeting for the organization of a Photographical Society was held in the lecture room of the American Institute, and on the corresponding day of the succeeding month, John W. Draper, Peter Cooper, John Campbell, Lewis M. Rutherfurd, John Johnson, Chas. W. Hull, R. Ogden Doremus, Chas. A. Joy, Cornelius Grinnell, Samuel D. Tillman, J. A. Rosevelt, James R. Chilton, Joseph Dixon, Henry H. Schieffelin, N. Sarony, and forty-seven other prominent and well-known citizens completed the organization of the "American Photographical Society," by the adoption of a constitution and code of by-laws and the election of officers. John W. Draper, M. D., LL. D., held the office of President during the first five years, and Lewis M. Rutherfurd from that time until April, 1867, when it was proposed to amend the constitution and by-laws so that the Society might become a Section of the American Institute. This change was effected in May, 1867, and the organization was placed under the control of the standing committee on chemistry, who reäppointed the then acting Society officers, as follows:

PRESIDENT:
LEWIS M. RUTHERFURD.

VICE-PRESIDENTS:
JOHN W. DRAPER, CHARLES A. JOY,
ABRAHAM BOGARDUS.

CORRESPONDING SECRETARY:
CHARLES WAGER HULL.

RECORDING SECRETARY:
OSCAR G. MASON,

TREASURER:
HENRY J. NEWTON.

The eighty-third meeting of the Association was held, under its new title, at the American Institute, June 10th, 1867.

# PROCEEDINGS

## June 10, 1867.

Lewis M. Rutherfurd, Esq., President, in the chair; O. G. Mason, Secretary.

After remarks by Prof. Tillman and others, upon the action of the American Photographical Society, and the Institute, resulting in the formation of the Section, the regular order of business was proceeded with.

Mr. Hull read a communication from Mr. W. H. Christian, of Richmond, Vermont, asking for information regarding unusual chemical effects on the surface of albumen paper. Mr. Hull also exhibited a camera with speculum reflector, as constructed for making unreversed daguerreotypes in the early days of the art.

Mr. Chapman read a paper upon the preparation of dry plates without the use of a sensitizing bath, by introducing bromide of silver into the collodion, and exhibited prints illustrating the working of the process, which he considered about five times as sensitive as the ordinary tannin process. He also exhibited a camera so constructed as to more effectually equalize the action of light in landscape photography, by vignetting the sky or giving the light portions less time of exposure.

Mr. Hull detailed a process described to him by Mr. Martin, of Albany, who first coats his plates as for tannin, then dips in a bath of acetate of morphine, one grain to the ounce, and develops with Gelat's iron developer.

Mr. Rutherford called attention to an error in the *Philadelphia Photographer*, regarding an article by him published in *Silliman's Journal.* He also called attention to and explained an error in the same journal and the *British Journal of Photography*, regarding the theory of correcting two meniscus lenses by the distance of separation or radii.

Prof. Vanderweyde exhibited photographs made by a single non-achromatic lens, and detailed experiments which he had made with such lenses before the introduction of the daguerreotype. After remarks upon the theory of distortion, in the images made by such lenses, he exhibited photographs made by a single achromatic and by an achromatic meniscus.

Mr. Mason exhibited a negative of an electric discharge during the severe thunder-storm on the night of May 11th. The image gave the course of the current in its passage from the cloud to the earth, and a view of the East river, and a portion of the city of Brooklyn beyond, and tops of several buildings in New York.

Prof. Tillman read a paper upon the phenomenon actinescence discovered by Cary Lee, of Philadelphia.

Mr. Rutherfurd made remarks upon the terms "floresence," "phosphorescence," and "actinism," and the actinic force of the spectrum rays, and the phenomenon of developing tannin plates long after exposure.

Mr. Hull made some interesting remarks upon the keeping quality of dry plates after exposure to light.

Prof. Rood spoke of the very short duration of the visible action of phosphorescence, it generally being only the fraction of one second, though, under one or two conditions, it lasts several hours.

Mr. Chapman stated that the keeping qualities of tannin plates seemed to depend in a great measure upon the strength of the tannin solution used in their preparation. The strong solution produced plates of better keeping qualities.

Mr. Hull chose weak tannin, as, by its use, he was able to produce greater harmony of effect.

Mr. Newton read a paper upon the keeping of sensitized albumen paper.

The Secretary laid before the Section two dozen stereographs of Green Mountain scenery, donated by Mr. A. F. Stiles, of Burlington, Vermont.

The Section then adjourned, to meet on the second Monday in November.

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## November 11, 1867.

Mr. H. J. Newton in the chair; O. G. Mason, Secretary.

Minutes of the last meeting were read and approved.

Mr. Hull laid before the Section a series of prints from negatives made by the Zantmyre lens, and globe lens, showing the relative field and illumination of the lenses. He also read a letter from Mr. B. F. Gage, of St. Johnsbury, Vt., accompanied by a cabinet photograph and ambrotype, showing the peculiarities of the process which formed the subject matter of his communication to the Section.

Mr. Hull also read the specifications of Mr. Gage's patent claim, as published in the *Philadelphia Photographer.*

Prof. Tillman asked whether any member had tried Mr. Gage's device.

Mr. H. S. Anthony thought it advisable that some competent person should try the process and report to the Section.

Mr. Hullenback explained a method which consisted of exposing the plate to diffused light after its removal from the camera and before development. Then followed a general discussion upon various methods which had been used to produce similar results.

On motion of Mr. Hull, a committee of three were appointed to make pictures by Mr. Gage's process, and by the ordinary negative process, and exhibit the results at the next meeting of the Section.

Messrs. Anthony, Hull and Chapman were appointed by the Chair to serve as such committee.

On motion of Mr. Chapman, the name of the Chairman was added to the committee.

The Secretary laid before the Society several elaborately illustrated books, produced by the American Photo-Lithographic Company; also a series of maps illustrative of some of the battle fields of the South.

Mr. Newton exhibited negatives and prints produced by his acetate of morphine process—1½ grs. to an ounce of 10 gr. tannin solution, giving an exposure of one minute, and also others with forty-five seconds exposure—which he considers at least ten times as sensitive as the ordinary tannin process. He develops with an ordinary iron developer.

Prof. Tillman called up the matter of photographic pictures of the recent fair of the Institute, followed by a general discussion upon their merits.

Mr. Anthony stated that the most sensitive preparation for solar printing, he had found to be oxide of silver, in (nitrate of ammonia solution, about 40 grs. to an ounce) oxide equivalent to 10 grs. of nitrate of silver. He had found a double nitrate of silver and ammonia to work well.

On motion of Prof. Tillman, the time of meeting was changed to the first Tuesday in the month, instead of the second Monday.

The Section then adjourned to the first Tuesdav in December.

## December 3, 1867.

Mr. H. J. NEWTON in the chair; O. G. MASON, Secretary.

Minutes of the last meeting were read and approved.

Prof. Tillman read a letter received from Professor Joy.

The committee appointed at the last meeting to try experiments with Mr. B. F. Gage's negative process, reported progress.

Mr. Anthony laid before the Section a very fine series of photographs, made by Adam Salomon, of Paris.

Mr. Newton explained a method by which he had produced a similar effect of illumination, by using a vignette arrangement between the back lens of the camera and the sensitized plate. Others suggested the use of reflectors for the local effects of light. Then followed quite an animated discussion upon the means for producing similar results.

Mr. Boyle exhibited and explained the working of a sub-marine telescope, which might be used for examining the bed of the ocean, or rivers; or by simple modification the same objective could be used for photographing objects under water.

Mr. Boyle also exhibited one of his ratio lenses, constructed by Mr. Alvin Clark, of Cambridge, Mass., and explained its construction, and gave a history of its manufacture and date of invention, which he fixes in the year 1861. He exhibited two prints from negatives made by his lens in September, 1863.

Mr. Boyle stated that the Zentmayer lens was identical in its construction, though not achromatised.

Mr. Newton exhibited dry plate negatives made by using tincture of opium and sugar of milk.

Tincture made as follows:

30 ounces water, 16 ounces alcohol,
2½ ounces tinct. opium, 2¼ ounces opium,
1½ ounces sugar of milk.

This he used to flow over the plate, after removing all free nitrate by washing or chlorising. Exposure in the camera about ouble the time required for a wet plate. Develop with iron.

The Section then adjourned to the first Tuesday in January.

## January 7, 1868.

Vice-President Joy in the chair; O. G. Mason, Secretary

Minutes of the last meeting were read and approved.

Mr. Newton exhibited a very fine series of silver prints, which he had made from negatives obtained of Messrs. Jordan, Bogardus and Thomas. The special object in exhibiting the series was for the purpose of comparing American prints with samples from M. Adam Salomon, of Paris, which were laid before the Section at the last meeting.

Several members pronounced the prints made by Mr. Newton, fully equal to those made by Salmon.

Mr. Mason exhibited a life-size carbon print, by Mr. Swan, of England; subject, portrait of Raphael, painted by himself.

Prof. Tillman called up the subject of carbon prints, at the recent fair of the Institute, and requested Mr. Joseph Dixon to explain the process of carbon printing which he had used many years ago.

After speaking of carbon printing in general, and the great fidelity with which he had been able to *fac simile* bank notes, he gave a very interesting account of the picture which he had made by the daguerreotype process in the month of September, 1839, which pictures he believes to be the *first portrait* made by the daguerreotype process in America. After the close of Mr. Dixon's remarks,

Prof. Tillman gave a resumé of the various claims which had been made for the production of the first portrait, and read extracts from two letters in proof of Mr. Dixon's claim.

Mr. Hollenbeck exhibited an oil painting by Mr. Boyle, who had devised it as a means by which vignettes could be printed with a light center graduated to a dark shade round the edge or margin of the print. A negative from the painting would have an opaque center, which would protect the vignette before which it was placed, while the margin would receive the light transmitted through the thinner portion of the negative.

Mr. Weeks explained a novel method by which he had produced vignettes in the camera.

Mr. Anthony exhibited several very beautiful transparencies made upon dry plates prepared with a linseed preservative made by steeping flax seed in a solution of acetic acid, one ounce, and water one ounce. He did not find it necessary to apply heat in its preparation. The mucilage thus made should be considerably reduced, so as to flow readily over the plate, leaving a very thin film. He had found that the solution worked most satisfactorily after having been prepared a considerable time, though he had produced good results with new solutions by adding a small quantity of tannic acid.

Prof. Joy exhibited specimens of Mr. Woodbury's photo-relief printing from metal plates, and explained the workings of the process as detailed to him by the inventor. He also exhibited the mitrex or photographic image in a gelatine film from which the metal plates were formed; also, several plaster casts from photographic impressions of microsopic objects. Prof. Joy also exhibited several photographic impressions in natural colors upon metal plates, by Niepes St. Victor, and gave some of the details of the process by which they were produced. A very thin film of silver was formed upon the plate, which was alternately exposed to the action of light in the camera, and to heat sufficient to raise its temperature to near the fusing point.

Mr. Anthony thought that the great obstacle in the successful working of Mr. Woodbury's process was the tendency to lateral spreading of the actinic action in the gelatine film, which rendered it very difficult to produce sharp definitions of fine lines and points in copies by it.

Mr. Dixon stated that all pictures produced in the solar camera must of necessity lack much in definition, from the fact that every ray of light passing into such instruments was so refracted as to preclude the possibility of obtaining a perfect image.

Mr. Chapman had found that far better results were produced by interposing a ground glass between the condenser and negative, than by allowing the unobstructed light to pass directly through the negative.

Mr. Boyle believed that a solar camera might be so constructed as to give far better results than are obtained by those now used.

The Section then adjourned to the first Tuesday in February.

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## February 4, 1868.

Prof. Joy in the chair; John Hollenbeck, Secretary *pro tem.*

Minutes of the last meeting were read and approved.

Prof. Joy presented a communication, with a print, from Dr. H. Carrington Botten. The communication was as follows:

"*Uranium salt for positive printing and measuring the actinic force of direct sunlight.*—The positive print was obtained by sensitizing the paper with the oxyfluorides of uranium and potassium, and formic acid. The print was made by Dr. H. C. Botten, who was the inventor of the process. The specimen was the first and only one taken by this process, and was very indistinct. It was brought forward at this early stage in order to fix the date of the invention.

"The picture is composed of the green fluorides of uranium and potassium, and is permanent. Formic acid produces no precipitate in a solution of oxyfluorides of uranium and potassium; but if the acidified solution be placed in the direct rays of the sun, decomposition begins immediately, and a green precipitate of the fluorides of uranium and potassium falls. The precipitate is quite insoluble in water and dilute acids, and could be employed to measure the actinic force of the direct sunlight.

"The sensitizing bath is prepared by adding a few drops of formic acid to a tolerably concentrated solution of oxyfluorides of uranium and potassium. The paper, while still wet, is placed upon the negative and exposed to the rays of the sun fifteen minutes."

Prof. Tillman called attention to recent discoveries by M. Pratt, of Paris, who claims to have isolated fluorine, the only chemical element before unknown in a separate state. He has made, by the direct combination of fluorine gas with silver, a fluoride of silver, which is more sensitive to light than chloride of silver. The ordinary fluorides are regarded by him as oxyfluorides. Upon this assumption, the combining proportion of fluorine is 29.5, instead of 19.

Prof. Tillman stated that the theoretical deductions which confirmed M. Pratt's statement that fluorine is a colorless gas, would lead us to place combinations containing fluorine lowest in the list of halogen compounds which are influenced by the actinic rays. Prof. Tillman had, at a previous meeting, stated some facts in relation to fluorides, and could not at present coincide with M. Pratt, but would at some future time give more information on the subject.

Prof. Tillman alluded to a statement made at a meeting of the Astronomical Society of London, that in the photographs of the lunar eclipse which occurred on the 13th of September last, a portion of the unobscured part of the moon was absent. M. De La Rue stated at that meeting, in relation to the nature of this phenomenon, that more of the moon was eclipsed chemically than optically.

Dr. Boynton said the interesting peculiarities noticed by British astronomers were probably due to the refraction produced by the earth's atmosphere. The luminous portion of the moon immediately surrounding the dark portion, is made visible by the solar rays which have passed through our atmosphere to the moon and then reflected towards us, in the course of which the actinic power of the ray is neutralized.

Mr. H. T. Anthony then stated some facts in relation to the same subject; after which

Prof. Joy presented for inspection a fine collection of views taken on the coast of Labrador, by Mr. J. Dunmore. The prints were highly commented upon.

Prof. Joy also presented a communication from Mr. J. Johnson, Saco, Maine.

Mr. E. Wilson, of Philadelphia, presented a very large and fine collection of carbon prints, which were made in France, by Swan's process. The prints were mounted on a variety of different colored papers.

The thanks of the members were tendered to Mr. Wilson.

Mr. Newton gave a very minute and detailed account of the mode of making the photographs which were exhibited at the last meeting.

The Section then adjourned to the first Tuesday in March.

## March 3, 1868.

Prof. S. D. Tillman in the chair; O. G. Mason, Secretary.

Minutes of the last meeting were read and approved.

In answer to a question upon the refraction and reflection of light, Prof. Vanderweyde stated that the light of the sun was refracted by the atmosphere of the earth, as it would be in passing through a globe lens, and by which a portion of the actinic force was absorbed. The luminous portion suffered less obstruction, and therefore, when reflected, as from the surface of the moon, might appear in excess. This was made apparent by photographs of the moon, the actinic force outside the visible image being sufficient to produce an impression longer than that formed by the luminous rays; therefore, in such photographs we see more of the surface of the satellite than we should with the unaided eye, or through the telescope.

Prof. Tillman believed that the vibratory wave of particles in space was equal to the reflected light of the sun, plus the light or effect from these particles.

Prof. Vanderweyde stated that yellow glass would not obstruct the actinic ray, if placed in direct sunlight. He attributed it to the fact of the actinic ray being much more active, or not so easily obstructed when accompanied by a great amount of the caloric ray. He had composed a prismatic spectrum with colored glass, and found that at noon, or when the greatest amount of caloric light fell upon the prism, the yellow and other non-actinic colors admitted nearly as active printing force as the blue and purple.

Mr. Hull had not met with any difficulty in working sensitized plates upon which direct sunlight had fallen after passing through the orange glass of his chemical room window, though the light was first transmitted through a plain glass window, at some little distance, and fell upon the orange glass at angles of about forty-five degrees.

Mr. Thomas had found, by careful experiment, that "flushed" orange glass was much better for obstructing actinic light than pot-metal glass, its efficiency being eight times greater.

Prof. Vanderweyde explained the manufacture of the two kinds of glass, saying, that as the best colors were very expensive, they were used only as a thin coating upon one surface of the glass, while the cheaper colors were mixed with the melted mass.

Mr. Reed (a visitor) had used yellow glass in direct sunlight without experiencing any difficulty; but the light reached his yellow glass after having passed through a plain window, as in the case mentioned by Mr. Hull.

Mr. Newton had prepared a good non-actinic glass by flowing plain glass with a solution of iodine in ordinary negative varnish.

Mr. Chapman had used a peculiar kind of tissue paper, and found it to answer very well for obstructing the actinic light.

Prof. Vanderweyde presented for examination a very fine 8x10 negative of Girard College, and explained the means by which it was made. The lens used was an ordinary orthoscopic, behind which combination he had placed a single achromatic plano-convex lens, leaving between it and the back lens of the orthoscopic about the same distance as that between the two lenses forming that combination. He also gave an interesting account of experiments which he had made with various combinations at Girard College, and exhibited a print 10x12, made by a two-inch non-achromatic meniscus lens costing one dollar. In making the negative he had used a diaphragm with one-fourth inch opening in front of the lens, and giving about one minute exposure. The print exhibited was very good, and occasioned considerable discussion upon the production of good results through what was commonly believed to be inferior means.

The Secretary gave a description of the focimeter which he used for testing the variation between the visual and chemical foci of lenses used for photographic purposes. The device consisted of a block of wood presenting the surface of an acute angle towards the lens under examination; upon the face of this angle was placed finely printed matter so arranged in combination with a scale reading each way from zero, as to admit of a test to the tenths or hundredths of an inch, and thus fixing the exact plus or minus length of the chemical focus, when compared with the visual, at any and all reductions or enlargements of the image.

Then followed a general discussion npon the relative merits of ammonia sulphurate of iron and plain iron developers. Most of those who had used the two, thought that the ammonia sulphurate of iron gave the finest and most uniform results.

The Section then adjourned to the first Tuesday in April.

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## April 7, 1868.

Mr. Charles W. Hull in the chair; O. G. Mason, Secretary.

Minutes of the last meeting were read and approved.

Prof. Vanderweyde exhibited a great variety of lenses used for photographic purposes, and explained their peculiarities. Among the number was one, both sides of which had been ground upon the same tool, which had a focus of twelve feet. He also exhibited a combination of prisms, illustrative of the necessity of flint and crown glass for the formation of a perfect acromatised image.

Mr. Boyle called attention to the recent lens controversy, published in the *Philadelphia Photographer*, and asked that a committee be appointed, and instructed to report to a subsequent meeting of the Section, upon the fidelity of his drawings as figured in the *Photographer* for January last, when compared with those attached to his own and Mr. Zentmayer's patent papers, and his own illustrations of the subject with lenses at a previous meeting of the Section.

After a statement of some of the leading points in the controversy by Prof. Vanderweyde, the Chair, upon motion, appointed as such committee, Messrs. Chapman, Newton and Thomas.

Mr. Hollenbeck exhibited a series of imperial card photographs, by Messrs. Gurney & Son.

Messrs. Huston & Kurtz exhibited a large and very fine collection of their carbon prints, in various colors.

In answer to a question by the Chairman, they stated that they used tissue by Swan, of England; Braun, of Dornback; Bingham, of Paris; and Rowells, of Boston. Rowells' tissue seemed the best adapted to this climate, and when worked with Swan's process gave the best and most uniform results.

The prints were much admired, and occasioned considerable discussion upon the various methods of carbon printing.

Mr. Wilson, of Philadelphia, laid before the Section several very fine portraits, studies by Adam Salomon, of Paris.

Mr. Griswold exhibited a collection of direct carbon prints, and stated that they could be made upon any ordinary white paper, and with as great or greater facility than silver prints by the ordinary photographic process now in use.

By request of Mr. John Johnson, the Secretary read from the *Scientific American* an article originally published in the *British Journal of Photography*, entitled "Contributions to the History of Photography;" after the reading of which Mr. Johnson called attention to and corrected several erroneous statements in the article.

Dr. Boynton inquired whether Mr. Johnson's experiments with bromide were published at the time, or soon after they were made.

Prof. Vanderweyde exhibited several cameras which were made and used soon after the discovery of the daguerreotype process.

The Section then adjourned to the first Tuesday in May.

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